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AIR FORCE MATERIEL COMMAND GUIDE

ON

INTEGRATED PRODUCT DEVELOPMENT

A GUIDE FOR UNDERSTANDING AND IMPLEMENTING IPD THROUGHOUTAFMC

25 MAY 1993

NOTES TO THE READER

This is the first edition of the Integrated Product Development (IPD) Guide. This guide is not a "cookbook" for the implementation of IPD. Rather, it is an introduction to a proven management philosophy that will aid AFMC in meeting our customers' needs. IPD is a management philosophy which applies Quality Air Force principles. **IPD is not the product.** IPD is the thought process that needs to become a part of the AFMC culture. This guide will be updated as we learn from AFMC what the best practices and procedures are and what additional tools, if any, are required.

There is no checklist for implementing IPD because there is no one solution. In fact, since IPD is a management philosophy based upon the interrelationship of principles, each application of IPD will be unique. There is not one road map everyone can use. Each application will have a unique plan and associated milestones for the implementation of the IPD philosophy. The manner in which IPD is applied to a given product will change over time as the environment and constraints change. The IPD philosophy provides a framework for working within a dynamic environment. As with all management philosophies, a continuing relook at what is being done, why it is being done, and how it is being done is required.

Senior management commitment to IPD will play a key role in the establishment of IPD in the AFMC culture. The implementation of IPD is the responsibility of everyone within AFMC and will be overseen by the Center Commanders. The Center Commanders will determine the reporting requirements for the IPD metrics.

Each individual needs to chose to implement and use this philosophy. Only through personal commitment to IPD will the maximum benefits be obtained.

INTEGRATED PRODUCT DEVELOPMENT GUIDE

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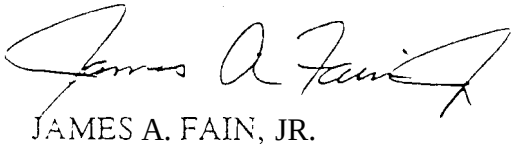
FOREWORD

The dramatic changes in our environment call for dramatic responses from everyone within AFMC. Given your outstanding achievements and support in the past. 1 know you are up to this challenge. In fact. the very concepts on which Integrated Product Development are founded were developed. proven and refined by you. If you don't recognize yourself in the first couple of chapters of this guide, keep reading. I'm sure you will eventually see how you can apply the concepts and gain the benefits of lnte grated Product Development.

We need to instill this integrated Product Development management philosophy in everything we do in AFMC. Resources are too scarce to be used in any way except the right way. and integrated product development is the right way. Decisions being made in a timely. integrated fashion. involving all stakeholders will produce consistent, quality products resulting in satisfied customers.

Integrated Product Development is a proven, powerful concept. A concept that we need for a successful Air Force of tomorrow.



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CHAPTER 1. INTRODUCTION

1. Purpose of the Guide. To provide every person within Air Force Materiel Command (AFMC) the information needed to understand and implement the Integrated Product Development (IPD) concept. IPD is the-culture that reflects how organization within AFMC does business and it does not mean an organization needs to restructure in order to implement IPD. Every person on the AFMC team should review this guide. The AFMC team includes everyone involved in sustainment. acquisition, support, services. as well as staff functions, including HQ AFMC staff and center staff.

2. How to Use the Guide. This guide is a reference book, not necessarily intended to be read from cover to cover. The guide is structured in two sections: the first is Chapters l-5, and the second is the attachments. "All you wanted to know about IPD" is in chapters l-5 (approximately, 30 pages). Everyone should read this section. These chapters are written so that they apply to everyone and all missions in AFMC. To see how IPD can be applied to your products and your specific environment, review the model that applies to you in Attachment A. Attachment B provides a Manpower and Personnel Checklist that will be helpful when structuring your teams. Attachment C contains additional reference material.

3. IPD Background

a. IPD is not a new program but a strategy for managing within AFMC and creating a TQM culture. If you are managing within the TQM principles, and vertically and horizontally integrating all functional activities towards common measurable goals -- you have a achieved IPD. IPD concepts have been utilized in various forms throughout Air Force Logistics Command (AFLC) and Air Force Systems Command (AFSC) for many years with outstanding results. IPD builds upon and draws together concepts proven through many AFMC (AFLC and AFSC) initiatives -- Company Concept. Concurrent Engineering (CE), Clear Accountability in Design (CAID), Process Management Teams (PMT), Integrated Product Teams (IPT), Quality Air Force (QAF), Theory of Constraints (TOC), etc. Implementation of IPD in AFMC ensures that we capitalize on these proven concepts and techniques. IPD represents "the next step" in the evolution of our management philosophy.

b. IPD has its roots in integrated design and production practices which emerged in the Japanese auto industry following World War II. In the early 1980s. U. S. industry examined integrated design as a way to improve competitiveness. In 19156. the Under Secretary of Defense for Acquisition chartered the Institute for Defense Analysis to examine the concept of integrated design, known as concurrent engineering.

c. IPD expanded Concurrent Engineering concepts within AFSC to include all disciplines. not just technical, and was referred to as Integrated Product Development. This expansion has resulted in the development and application of an innovative single management structure utilizing an integrated master plan and an integrated master schedule.

d. AFLC recognized the core values of customer/product focus, fast response, teamwork and continuous improvement. As a result, in 1990 AFLC reorganized the Air Logistics Centers (ALCs) using the product directorate (team) concept.

e. Further maturation of IPD stemmed from the development and implementation of Integrated Weapon System Management (IWSM). The White Paper: "IWSM in AFMC." dated 28 January 1992, encourages use of the Integrated Product Development management philosophy. AFMCR 500-1 1, dated 1 November 1992. identifies the use of Integrated Product Teams as the fourth key element of IWSM.

f. Today, many organizations within AFMC have implemented and are benefiting from IPD. The AFMC goal is for everyone within AFMC to embrace the philosophy of IPD and to institutionalize it within our culture. As part of this command's continuing commitment to the customer and to quality products, AFMC/CC has stated that IPD will be implemented command wide by October 1993.

4. What is IPD?

a. IPD **Definition:** A philosophy that systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient product that satisfies customer's needs.

b. **Product Definition:** Product, as referred to **in** the IPD Definition, is not only what is delivered to your customer (e.g., hardware, software, patient care, flight test reports. documents...), but also processes (e.g., design. manufacturing, test. logistics. acquisition security...) which make the product possibie. Products range from complete weapon systems to individual end items, from request for proposals to briefings, as well as policies **and** processes.

c. IPD **Tenets:** The IPD philosophy embodies eight key tenets as defined in the IPD White Paper dated 2 1 April 93 (Attachment C-4). Application of these tenets in your day to day activities will result in institutionalizing IPD.

(1) Cultural Change **- Embracing the IPD philosophy requires purposeful, multi-disciplined teamwork. The priority of focus for IPD should be:**

(a) The customer
(b) The product
(c) The process
(d) Constraints, . ..and then
(e) Organizational structure

The cultural change is the move from a functional focus to one based on products and multidisciplined teams. The team follows a logical sequence in order to develop the management and decision making processes necessary to implement IPD. The sequence of focus for IPD includes: the customer, the product, the process, constraints, and organizational structure. The first step the team must take is to focus on each customer and the customer's needs. The customer can be internal to an organization, or external. A team or organization normally has many customers. The customer's needs will determine what the product will be. The team must implement the necessary processes in order to deliver the product to the customer. The customer, the nature of the product, and the organization structure provide the constraints put on the multidisciplined team. This may require modification to existing processes, development of new processes, and changes to organizational structure.

(2) Product ***Focus*** **- IPD requires a product focus and a complete understanding of the processes required to optimize the product.** AFMC products take many forms e.g., technology, hardware, software, programmed depot maintenance, repair of line replaceable units, patient care, processes. policy.... In each case, the product must form the cornerstone of the organization's business focus. The products delivered will dictate the ultimate success of our efforts in the eyes of the customer. Processes (e.g.. product design, RFP development, cost estimating, and modification kit installation, ...) required to deliver the product to the customer must be understood in order for the team to make the necessary trades to optimize the product.

(3) *Up-front* ***Planning*** **- The life cycle of a product or process will be integrated through comprehensive, up-front planning that must include all functions, customers, and suppliers.** Up-front product life cycle planning, which includes all functions, customers and suppliers, lays a solid foundation for the various phases of the product's life. The first step in the planning process is to define the key program events that must take place in order to deliver to the customer. The focus should be on events, not schedules or resources. When the required program events are clearly defined and understood. then resources can be applied and the impact of resource constraints can be better understood and managed. The more up front

planning accomplished, the less potential for unforeseen issues surfacing during accomplishment of your activity.

(4) *Right People, Right Place, Right Time* - **All functions that impact the achievement of the customer's requirements should be applied concurrently, in a team fashion, throughout the life of a product or process.** The right people at the right place at the right time are required to make the right timely integrated decisions concerning the product. Each team has a leader with the responsibility to ensure the right people are members of the team and are involved in the team decisions. Team decisions are based on the combined input of the entire team, (e.g., engineering. manufacturing. logistics. financial management, contracting, personnel...) ail appropriate disciplines, to include customers and suppliers. Early industry/supplier involvement is essential to building teamwork, reducing risk, and improving your strategy. Industry/supplier involvement supports the timely identification of "cost drivers" and informed decisions on technical or schedule risk and tradeoffs. In a competitive environment, this must be accomplished as outlined in SAF/AQ policy letter on early industry involvement (91 M-001, 20 Jun 91). (See Attachment C-5 for the policy letter.) This results in a potential for significant cost savings and product improvements. The integration of functional and industry/supplier experts in this way enhances functional influence throughout the life cycle of the product.

(5) Teamwork and Communication - **People must function as a team. Team success, facilitated by rapid, open communication, must be emphasized and rewarded. Management relationships must be developed which are consistent with and focused on achieving the team's measurable goals and objectives.** Effective communication and planning are the keys to successful teamwork. Communication must be open and free-flowing within teams as well as between teams. Each team member needs to understand their role. the roles of the other members, as well as the constraints under which other team members operate. Supervisors and leaders should encourage open communication by acknowledging and rewarding team achievements. In addition, teams must focus on achieving goals and objectives. One way to channel this focus is to develop a metrics system that facilitates meaningful data collection and presentation. Metrics foster process understanding an3 motivate actions for continuous product and process improvement.

(6) Empowerment - **Decisions must be driven to the lowest possible level commensurate with risk. Resources should be allocated at levels consistent with authority, responsibility, and the ability of the people.** Empowerment is a responsibility as well as a right and it means teams are responsible to challenge and improve their processes. not ignore them. Making decisions at the lowest appropriate level in an organization leads to more timely and precise decisions. This empowerment is effective because the right people have a direct and visible input to the product. In addition, the data available at lower levels is less filtered by management layers and may, therefore, be more precise. The teams at each level

use this data to make decisions. The level of detail required, and the resources associated, should be related to the perceived level of risk. The team must be given the authority. responsibility, and resources to manage their product and its risk commensurate with the team's capabilities. The team must accept responsibility and be held accountable for the results of their effort. It is the team leader's responsibility to facilitate the team, not make the team decisions.

(7) ***Seamless Management Tools*** **- A framework must be established which relates products and processes at all levels to demonstrate dependency and interrelationships. This hierarchical interrelationship must be understood and appropriate partnerships established to ensure that all decisions are optimized toward the ultimate user's end product.** A single management system must be established that relates requirements, planning, resource allocation, execution and program tracking over the product's life. This integrated approach ensures teams have all available information enhancing team decision making at all levels. These tools ensure integration of products and processes that leads to increased customer satisfaction.

(8) ***Integration Throughout the Life Cycle*** **- IPD will encompass all products and processes, regardless of the point in their life cycle.** Products evolve over a life cycle. What begins as a research effort may evolve into a weapon system acquisition and later, may be managed as a subsystem and will eventually need to be sustained. Planning and planning processes must recognize this evolution while ensuring the continuity of management and management information throughout the product's life cycle. Organizational structures may also evolve to reflect the needs of the product in the life cycle. These changes may involve team composition, tools, and/or processes.

d. IPD is based upon common sense decision making. IPD involves bringing the right people together at the right place and right time to make the right integrated and timely decisions. The IPD philosophy can and should be applied to any and all levels within an organization. If all of these tenets have been applied, then the activity is operating under the IPD philosophy. If an activity is operating within the IPD philosophy, then every person involved should be able to tell what their products are, what their decision authority is, and what there authority and responsibility are within the organization.

5. Why IPD?

a. The challenges facing AFMC today require that we move away from our old way of doing business and pursue a new management paradigm. The old paradigm was based upon the theory of centrally controlled and centrally executed operations - most decisions were made at the top. The new paradigm is to operate as a centrally controlled and decentrally executed operation -- through the employment and empowerment of teams. This involves a

need to move from a functional focus to one based on the products required by our customers. (See Attachment C-l for more on this paradigm shift.) IPD is the key to this paradigm shift.

(1) This new paradigm is the same paradigm that 2 1st Century Corporate America has discovered: a) Satisfy customers by delivering quality products which meet their needs, b) Increase timely integrated decisions by evolving to centrally controlled, decentrally executed operations, and c) Change focus by integrating people, processes, tools, and technology into multidisciplined product oriented teams.

(2) Several industry success stories demonstrate the benefits of this paradigm. With the development of the Saturn. a new division within General Motors broke away from their traditional culture and created a new organization that empowers the workers without the traditional supervision. The result is an American vehicle that is competitive against the import market. The Ford Motor Company, after losing market share to the Japanese with their higher quality cars and shorter development times, abandoned its functionally oriented approach to development and formed a team of specialists to develop its highly successful Taurus. Motorola saved their company by creating a new culture through the establishment of department teams that paid less attention to organizational boundaries and more attention to employee participation. Their focus on the customer was across the functional organization instead of up and down the vertical functional stovepipe.

(3) These are just a sampling of the many success stories that demonstrate that the acquisition cycle of a product can be shortened, total costs can be reduced, and producibility, supportability and product quality can be improved. Industry recognized the need for a product focus and implemented it with proven results.

(4) The compelling reason driving the implementation of IPD within AFMC is to maximize our limited resources, while delivering a higher quality product to our customers; not by doing more with less but by making the right decisions within the resources available.

b. Everything we do within AFMC is directly related to products delivered to our customer. This includes acquisition, sustainment, support, service and staff functions. The reason IPD is being implemented command wide is to increase customer satisfaction through the delivery of higher quality products within available resources. In this dynamic environment of dwindling resources, our greatest challenge is to do the right things with the limited available resources. Using the IPD philosophy provides a framework to make these right decisions.

6. IPD **Benefits. The** ultimate benefit is an increase in customer satisfaction! This results from higher quality products delivered in a timely manner as a result of more efficient and cost

effective operations, accomplished through empowered. fulfilled people. Specific benefits include:

a. Reduced overall time to provide a product to the customer. The team (with all necessary disciplines represented) makes and lives with the product decisions. Decisions that were formerly made sequentially, are now made in an integrated forum. These integrated decisions should ensure optimization of the product and associated processes, not the individual functions. These decisions, by taking a total life cycle perspective, should minimize the number of downstream changes required. This results in significantly reduced time to deliver the product to the customer.

b. Reduced product cost. The funding profile associated with a product will change. Some additional money may be required upfront, but the overall cost should go down. This is achieved in two ways. First, there will be reduced need for redesign and rework for products since all appropriate disciplines are involved concurrently in the decision process. Second, there will also be a reduction in the time to deliver the product to the customer.

c. Improved quality. The teamwork integral to IPD results in more integrated decisions. These decisions will result in a higher quality product which is easier to produce and support.

d. Improved Communication. IPD breaks down barriers and opens the communication channels to provide effective, efficient communication channels. Everyone involved in the process understands their role, responsibility and authority as individuals, as team members and as a team.

e. Ease of management. IPD provides a framework for ensuring all information related to an issue is available making for better, more timely decisions. Ideally, this information is collected and integrated by product ensuring an accurate representation of the product is made. IPD serves to empower each team based upon their capability to make the timely integrated product decisions required to deliver their product.

f. Clear Focus on Risk. IPD focuses risk management efforts by tying risk directly to the product so the integrated team can effectively manage it. Effective risk management requires the early and continual involvement of all of the players in the development process, including the user, laboratories. support agencies, and suppliers. Integrated product teams are formed and resources allocated based on varying levels of risk associated with different aspects of the product development. Risk management occurs by: analyzing the particular issue/problem being addressed, identifying the risks for achieving an efficient resolution, then putting into place and managing a risk mitigation effort. This identification/mitigation is most effectively addressed by bringing together the right team to assess and analyze the risks and then manage them to closure.

CHAPTER 2. IPD IMPLEMENTATION

This chapter introduces the key elements in a generic IPD model and outlines the critical steps for a team to develop a disciplined approach which effectively uses available resources and provides quality products expected by our customers. The chapter then describes two critical elements for successful implementation of the IPD model: early industry involvement and the use of tools to identify risk and measure process improvement.

1. Generic IPD Model

A generic model (Figure 2- 1) has been developed to illustrate IPD relationships. This model is intended to be very general and address concepts only. IPD is a philosophy having no one solution or implementation strategy and whose implementation is product dependent based upon product scope, life cycle phase, complexity.... IPD can be applied at any and every layer within an organization. Any layer within an organization can have a multitude of IPD 'models' being applied at any given time. Where there is a requirement from a customer requiring action by AFMC assets this model should apply.

GENERIC IPD MODEL

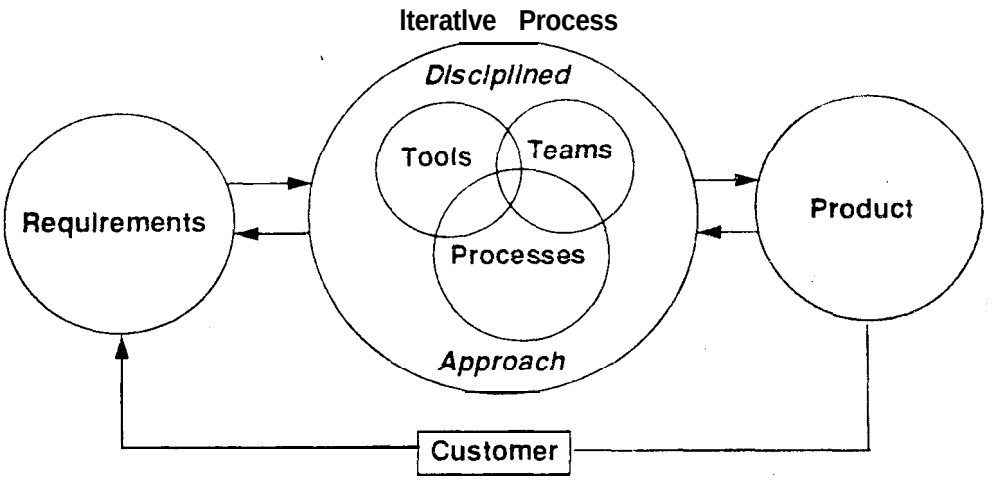

Figure 2-I

This generic model is made up of four main elements: requirements, the iterative process where AFMC assets are applied, the product, and the customer for ultimate acceptance of the product.

a. Requirements: The first element of the IPD model is the customer's requirements. Since the requirement is generated by the customer, knowing the customer is an essential part of this element. The customer may be an internal (within your activity, organization. AFMC) or external customer (User, Air Staff, FMS...). Ideally, the requirements are well defined. understood, and stable. Often this is not the case, and the requirements are refined as AFMC assets are applied in the iterative process.

b. Iterative Process: Through an iterative process of applying AFMC assets to a requirement, a product is produced. These AFMC assets include personnel, money. processes. time, and facilities. In other words all that we do within AFMC.

(1) Processes: In the past, day to day decisions were made sequentially, often optimized to a functional solution. Under IPD, the integrated team brings all needed functions. and therefore functional expertise, to bear on product decisions with a focus on product issues. To ensure we are using our resources as effectively and efficiently as possible, we need to understand what processes are required to produce the product, and how this process impacts the product as a whole. Processes should be evaluated to ensure they are structured for maximum effectiveness by the teams.

(2) **Tools:** Tools are the documents, data systems, and methodologies which provide a shared framework for planning, tracking, and executing a product or activity. The tools define the product(s) or activity(s) to be developed, delivered or acted upon, and relate the elements of work to be accomplished to each other and to the end product. This interrelationship of products and activities must be understood to insure all decisions are optimized toward the customer's product. The primary purpose of the tools is to enable the cross-functional IPT to share and integrate information and make decisions at the lowest level commensurate with risk. Prior to IPD there was a functional focus with data being made available to the pertinent functionals. The data was mostly historical in nature and used primarily for sequential decision making. IPD attempts to change this. The tools serve to focus on the product ensuring all available data is made available to the entire team. The data needs to be received in a timely manner to ensure the early identification of potential problem areas anti timely integrated decisions.

(3) **Teams.** Teams are the heart of IPD. These IPTs are made up of everyone who has a stake in the outcome or product of the team. This includes AFMC assets. and non-AFMC assets. Involving the suppliers and customers as members of the team as early in team formulation as possible is essential. They are integral members of the team. Successful application of IPD rests heavily on the ability to build, empower. and nurture these multi-disciplinary teams. IPTs should be focused on their specific product or process. Collectively. the team members should represent the know-how needed for getting the job done. Successful IPTs engage in considerable front-end planning and preparation. selecting the right mix of

people and disciplines, skill levels and making certain that both the supplier and customer are involved. The team needs to clearly understand the team's, as well as the individual team member's roles and responsibilities. IPTs must be empowered commensurate with both the skills and ability of the team and with the risks associated with the program and the product(s) of the particular team. They must possess the responsibility. and resources to manage both their product and processes and associated risks within their defined authority. For more on IPTs see Chapter 3.

c. Product: Product refers to everything we produce in AFMC. Product can take on several forms depending on the role of the organization (e.g., policy, hardware, software, maintenance support, fiiefighting protection, weapon systems, modifications, aircraft repair, spare parts...). The product forms the cornerstone of the organization's business and dictates the ultimate success of the organization in the eyes of the customer.

d. Customer: Even though the customer is normally a member of the IPT, the customer is the ultimate decision authority regarding the quality and relevance of the product. Any changes to the formal requirements driving the product need to come through the customer Define what the customer requires and then focus on meeting the requirements.

2. **Disciplined Approach:** A key to the success of the IPD model will be how we utilize our resources. In this iterative process of applying AFMC resources to transform a requirement into a product, a disciplined approach should be used. The disciplined approach requires the development of a framework to organize activities of those involved. This framework is valid for all missions we fulfill within AFMC. Utilization of this framework should help to scope an issue, product, process, or activity, as well as identify impacts of an action on the product. This disciplined approach should become part of our thought process and should be applied to essentially everything we do. The outcome of this approach should be documented for significant decisions, products, processes, or activities. The decisions made using this approach should be continuously reevaluated as circumstances change. (Additional discussion on disciplined approach can be found in attachment 1.)

a. Understand Requirements: The requirement can be generated by an internal customer (can be the team) or it can be generated by an external customer. This step is consistent with and irnmediately follows the Requirements element of the model. A common understanding of the team's requirements must be achieved.

b. Outline Approach: This step serves to scope your effort or activity required to meet your requirement. Before the team outlines their approach, the team should identify their strengths (things which will help them achieve their objective) and their constraints (things which are working against them and their objective). Recognizing the strengths and weaknesses you identify all the activities and subproducts necessary to meet your requirement. The depth of identification of the subproducts or activities should be commensurate with the

risk of the product or activity. You should identify the management processes that apply to multiple subproducts or activities, especially those that integrate the products into a complete system and control the interactions. These interactions may be with internal or external customers. Using this data, you identify a common thread - a way of tying together these activities of subproducts relative to each other. This common thread (e.g., Work Breakdown Structure (WBS)) will serve as a logical way to collect data, communicate requirements, issues, and concerns as you walk through the process of transforming a requirement into a product. It is important to utilize a cross functional team in this activity to gain the greatest understanding of all that is involved in the accomplishment of an effort. The more complete and accurate the up front planning, the less opportunity there will be for problems during execution. Use of tools such as line response charts could prove effective.

c. Plan the Activities: The next step in this disciplined approach is to plan each activity. The work must be defined that will result in successfully completing an event. The criteria for product or activity success should be defined. This technique ensures all parties fully understand what is required to proceed to the next activity and serves to focus management attention on the associated risk areas. Wherever possible in these planning activities, it may be prudent to include the user and/or contractor or other suppliers. If working in a competitive environment, be sure all potential offerors have equal access to all planning activities to avoid potential protests. Equal access, in this context, refers to equal opportunity and timely knowledge of such opportunity to access information.

(l) Establish Event Driven Plan with Success Criteria: This step integrates what was done in the "Plan the Activities" step. This step describes how the work will be accomplished and ties all the work activities and subproducts together. In some cases this step is proposed by a contractor or other government agency and is verified within AFMC. This effort describes what is required prior to proceeding to the next activity or product. Ideally this step will also describe how each activity or product will be measured. The effort required to accomplish an activity and how activities and products relate and interrelate drives schedule and the overall project risk. This step results in an integrated plan. The integrated plan can take on many different forms. i.e., 3 structured integrated management plan. a plan correlating existing documents which focus people's efforts on a particular product or activity. a simple matrix or a combination of these. Each product or activity should contribute to the structure of this integrated plan. This step (developing an integrated plan) should help control cost overruns and schedule slips.

(2) **Schedule Events:** Actual times are assigned to various activities during this step of the disciplined approach. Critical paths should surface. This step allows a realistic schedule to be developed given that each activity and its relationship to previous and subsequent activities are well understood, The result of this step is an integrated schedule. This schedule should be developed by the integrated team.

d. Allocating Resources: Once the integrated plan and integrated schedule are developed, you will have to allocate resources to effectively manage **and** produce the activity or product. This allocation may be a new allocation or an adjustment to the allocution that already exists. The key here is to base the allocation of people, dollars and time on the assessed risk of rhe product or activity. In other words, the higher risk areas should have a greater allocution of resources than the lower risk areas. It is important that the allocation of resources be done with the entire team.

(1) People: In structuring work assignments for your people, it is important to consider such aspects as achieving the right functional mix and skill level as well as encouraging a barrier-free work environment that fosters the multi-functional interaction essential to IPD. Additionally, prior to making any changes in your organization to ensure its efficiency and effectiveness, you must ensure the appropriate paperwork is accomplished to protect you and your people. A checklist is provided at Attachment B to aid you in your efforts. If working with a contractor, having the government and contractor organizations mirror each other may make the activity or product easier to manage.

(2) **Dollars:** The process of allocating dollars assigned to the activity or product is the next step. One of the tenets of IPD is to drive authority and responsibility to the lowest level of the organization commensurate with risk. Responsibility to manage within a budget should be allocated to each team, rather than by functional organization. Since your organization now reflects the "common thread" used in your basic tools, cost information should be collected and presented in a manner supporting the individual teams. Allocation of dollars within the team should be the responsibility of the team.

(3) **Time:** The allocation of time and the scheduling of activity needs to occur to ensure the integrated schedule meets the needs of the activity or product with the least possible risk.

e. Tracking and Executing: Tracking and executing the plan will undoubtedly be the largest phase of the overall effort. The key to making this phase easier to manage is effectively using the integrated structure. Each team should be using integrated tools to focus on the cost, schedule and performance of the subproduct or activity it is responsible for When dealing with an outside agency, you may want to consider obtaining real time access to their cost, schedule and performance data. This approach will significantly enhance the timeliness of management decisions. However, the nature of the data obtained must be clearly understood by each member of the team. For example, draft or preliminary data must not be mistaken for a final product. The team should be the body of up-to-date knowledge that is most familiar with its product. Timely integrated decision\ thataffect the performance of the activity or product will result in the best product and therefore the most satisfied customer. Successful execution will be heavily dependent upon the integration of associated activities.

3. Early Industry/Supplier Involvement. Obtaining early industry/supplier involvement in those cases where there are industry/suppliers involved, is vital to the success of IPD. Teaming customer and developer with industry/supplier as early as possible is important. This truly integrated team can match threat or need against requirements and technical/cost/schedule risks of those requirements against industry/supplier capabilities. With all team members focused on the product, we can create the best possible strategies and decisions (what, when, and how to procure) and user satisfaction with the end product. Early. open, and effective communication results in efficiently tailored and documented requirement\. as well as fewer adversarial relationships. While the Procuring Contracting Officer (PCO) remains the single point of contact for communicating with industry, the PCO and the product rnanager jointly decide the level of industry/supplier involvement needed. It is important to remember that information concerning acquisition/support/service should be provided to all interested offerors so that no source receives an unfair competitive advantage. Early identification of potential offerors is therefore essential. Early industry/supplier involvement is divided into three phases which are: (1) Phase I: lnitial Acquisition and Strategy Development, (2) Phase 2: Acquisition Strategy and Coordination. (3) Phase 3: Formal Request for Proposal (RFP) Preparation. You should consult SAF/AQ policy memorandum 91 M-001, dated 20 Jun 91, for details on early industry involvement tools and techniques available during each of these three phases (Attachment C-5).

a. Initial acquisition strategy for development and sustainment programs lasts from initial communication of the requirement to the product manager until completion of the integrated Acquisition Strategy Process (IASP). Communication in this phase is generally through quests for information, informal discussions, and presolicitation conferences.

b. Acquisition Strategy and Coordination lasts from the IASP until release of the draft Request for Proposal (RFP). Communication is usually in the form of technical libraries, electronic bulletin boards, and presolicitations conferences (en masse or individually; one on one).

c. Formal RFP Preparation lasts from release of the draft RFP until release of the actual RFP. Communication is usually through the draft RFP, electronic bulletin boards, presolicitation conferences, or the ombudsman. A very formal post RFP issuance communication process (source selection) has been established. All communications are funneled through the PCO. For sustainment, once the final negotiated delivery schedules for repair and material procurement are defined, then formal communications should be made through the buying agency production control organizations.

d. For additional information on Early Industry Involvement see Attachments C-5 and C-U.

4. **Risk Management.** Risk management is a concept that assumes many forms in its implementation. It is accomplished by identifying risks to the product or process as early as

possible, determining the cause(s) for each risk and its significance to the product or process, and developing and implementing effective abatement measures that either (a) eliminate the risk or (b) provide sound control measures to minimize its effects or (c) provide adequate resources to manage assumed risks. Integrated product teams are responsible for accomplishing these tasks and may do so using any number of the many forms of risk management that fit their circumstances. However, all good risk management programs will have the following characteristics:

a. There is a planned and documented risk management process for the program.

b. The process is based on a prospective assessment. The team looks ahead to find and manage possible problems.

c. The initial assessment is periodically redone to validate the initial findings and to uncover new problem areas.

d. The program has a defined set of evaluation criteria that covers all facets of the program, especially areas of technical risk (technology, threat (requirements), engineering logistics, and manufacturing).

e. The on-going results of the risk management process are formally documented.

More information on risk management can be found in AFMCP 800-52 (DRAFT), Acquisition Risk Management **Guide.** MIL-STD-499B (DRAFT) also notes that technical performance measurements **(TPM)** covering all technical parameters are used to identify deficiencies that jeopardize the ability of the product to meet performance requirements. As the TPM profile\ change, risk assessments and analyses should be updated accordingly. The particular TPMs used should be established by the IPT and documented.

CHAPTER 3. INTEGRATED PRODUCT TEAMS

1. What are IPTs? A key aspect of the management philosophy is the creation of cross-functional teams that are formed for the specific purpose of delivering a product or managing a process for the customer. The concepts of effective team formation apply to all types of teams. Implementation of IPD represents a transition from a work environment primarily based on individual efforts to one primarily based on work products produced by teams. People with complementary skills are committed to a common purpose, performance goals, and approach for which they hold themselves mutually accountable. People will now interact primarily to focus on the overall performance of the system rather than to focus on individual performance goals and accountabilities.

a. IPTs can be applied at various levels ranging from the overall structure of an organization to informal groups functioning across existing units. IPTs can be formally chartered or natural working groups. Implementation of IPD, therefore, does not mean an organization needs to restructure. IPD is the culture that reflects how an organization does business.

b. The team is not the end goal of IPD. but rather the means through which much of the work in an organization gets done. The teams are created for the specific purpose of delivering a product or managing a process for their customer(s). These teams can be created, formed, and their talents applied at all levels of the organization ranging from the overall structure of the organization to ad hoc teams that address specific problems. Examples of IPTs are in the Models section in Attachment A.

c. Teamwork represents a set of values. It encourages listening and responding constructively to others, giving others the benefit of the doubt, providing support, recognizing the interests and achievements of others and making decisions based largely on consensus. Teamwork within the framework of IPD drives the functional and product disciplines into a mutually reinforcing relationship. This relationship comes into being because the process of arriving at a common solution eliminates confusion over purpose and the reliance on the hierarchical chain of command to resolve conflicts and make decisions.

2. Key **Characteristics**

a. The purpose of an IPT is to bring together all the functions that have a stake in the performance'of a product/process and concurrently make integrated decisions affecting that product or process. Rather than try to define an "ideal" structure. it is more important to understand the key characteristics of an IPT. These key characteristics are summarized in Figure 3-1.

Key Characteristics of IPTs

- **Team is set up to produce a specific product or service**
- **Multidisciplinary - all team members/functions working together towards common goal**
- **Members have mutual, as well as individual accountability**
- **Integrated, concurrent decision-making**
- **Empowered, within specific product or service goal, to make decisions**
- **Planned integration among teams towards system goal**

Figure 3-1

b. In the simplest sense, an IPT can be formed for a temporary effort, such as a briefing or process improvement effort, and consist of only a few people that work closely together until their product is delivered. This type of IPT is sometimes referred to as a Tiger Team, or process action team. They are created to accomplish a specific task with a defined life span, and are dissolved when that task is completed.

c. A more formal IPT could be an entire organization. also known as natural working group, such as a Program Office (i.e., System Program Director (SPD), Product Group Manager (PGM), Materiel Group Manager (MGM)) structured around a hierarchy of IPTs addressing several different levels of the product(s). In this hierarchy. Figure 3-2, the system represents the top-level item delivered to an end customer such as an operating command. Below this, the system is divided into various product IPTs that, when integrated together, create the overall system. The makeup of the team at each ievel should involve all stakeholders, as appropriate. These IPTs have specific defined responsibilities for a product or service which must be coordinated with the rest of the organ; zation. Depending on the risk associated with each product. additional layers of subproduct IPTs may be created. For instance, a product that possesses a high degree of risk may justify the creation of sub-product IPTs each focusing on one area of the product development. Each IPT is responsible and accountable for delivering the product to its customer. In the case of lower-level IPTs, their customer is the next higher-level IPT. Key to this structure is the horizontal and vertical integration of products and processes within and between IPTs.

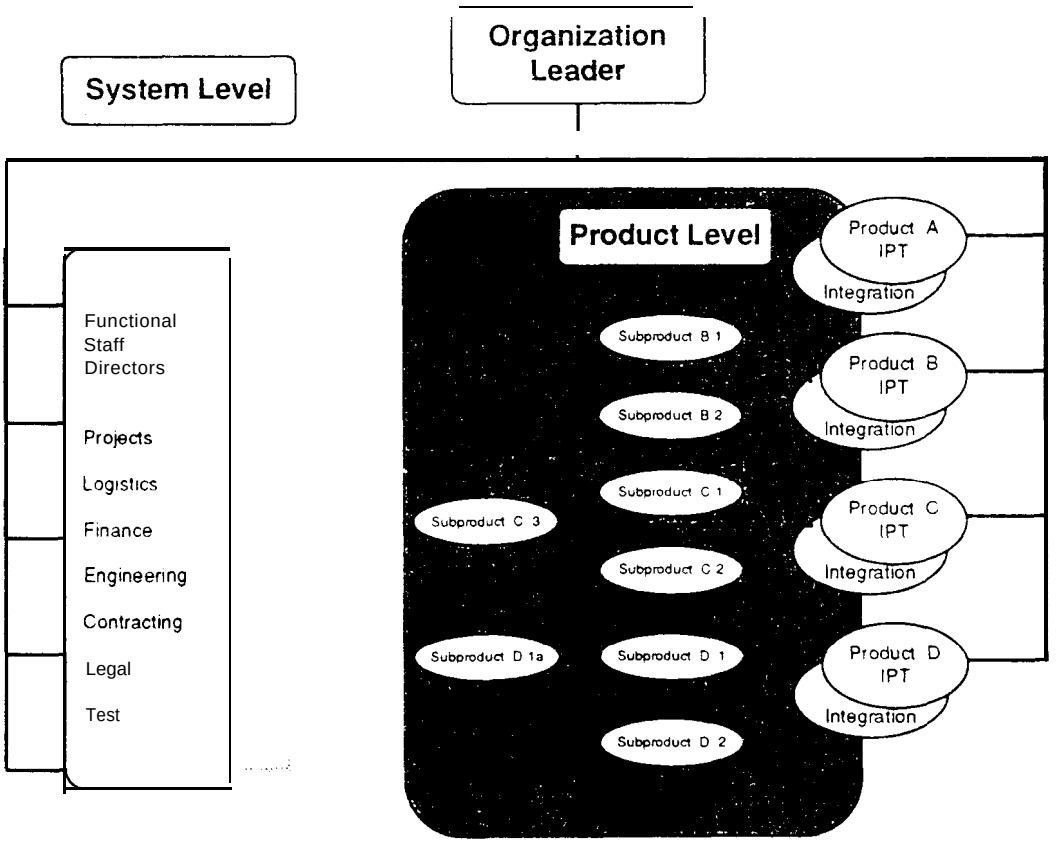

Figure 3-2

d. The IPT concentrates on optimizing the product(s) within their defined responsibilities by involving all functional skills in an integrated decision making process. Effective teams. producing a fully integrated product or service. not abstract commitments to team work or empowerment, are the real drivers of top-flight organizational performance.

e. Some larger IPTs are actually a consortium of smaller IPTs focused on delivering meaningful pieces of a larger product. In this case, it is not the organizational structure that is important. It is the documented interdependencies between teams that form the singleness of purpose that enables a focused product and a consistent face to the customer. Interdependencies, partnerships, and relationships between teams and among people on teams is what is important to IPD implementation.

3. Holes and Responsibilities

a. Functional Staff. IPTs will be supported by a functional staff as shown in Figure 3-2. In organizations with a network of IPTs, the functional staff may reside within the organization. One example of this is the role of acquisition security professionals collocated out of the security police home office to provide System Security Engineering Management inputs as members of IPTs. In small organizations, the functional staff may reside at the center level or at the headquarters. In each of these situations, the functional staff performs four major roles.

(1) The functional staff is responsible for the technical excellence of their area. They should continuously strive to improve the processes that are being used within the IPTs. They should also keep abreast of developments outside the organization that may affect their processes and the overall product, such as policy changes, legal developments or technical breakthroughs.

(2) The functional staff is responsible for managing the personnel aspects of their discipline by providing qualified people to the IPTs. In this capacity, they are responsible for the continuing professional development and training of their people assigned to IPTs.

(3) The functional staff chiefs, together with the major product level IPT team leaders. act together as a cross-functional, product-level team that advises senior management on issues that affect the overall system. Another product they also have is support to the product-level teams.

(4) Functional staffs provide a home for people who are members of more than one team and are not physically located with a single IPT and provide resources and performs work that cannot be performed wholly within the IPTs resources. As a part of the management of resources within an organization, there will be times when people must be shared among IPTs, especially when they possess specialized skills or are limited in number.

b. **Team Members.** Selection of the appropriate team members will depend on the unique characteristics of the product in terms of cost, performance and risk. Any discipline that has an effect on the performance and life cycle support of the product needs to be represented. Representatives from many centers and geographic locations may reside on the same team Representation from these disciplines is necessary to ensure that integrated decisions are made and sequential processes are avoided. Teams size will change depending upon what phase of the life cycle the product is in.

(1) IPTs will likely have two types of members: core and part-time. Core members are the full-time members of the IPT; part-time members participate on an as needed basis. The

part-time member situation may occur when a person with specialized knowledge is required by multiple teams or if the risk or workload associated with that function does not justify full time membership.

(2) Selection of full-time team members will depend on product risk. Initially, the team leader must determine which functional areas present the most risk to the teams success and select team members based on this information. After the team has been functioning for a while, team members may ask the team leader for assistance from disciplines not originally included on the team. Sub-groups can also be used on an ad-hoc basis to facilitate the continuous sharing of information and the development of break-through solutions to difficult problems effectively and efficiently.

(3) Co-location of team members facilitates the most effective communication within a team, however, there will be times when a given discipline is not represented on a full time basis. This is usually due to a single functional resource being assigned to more than one team or a team member being geographically separated (e.g., other center, contractor). This is also the case with temporary, short term IPTs. The team must address how they will integrate the inputs of these physically separated team members into the day-to-day functioning of the team. Establishing daily meetings, video teleconferences, electro-mail, continuous sharing and understanding of ideas and the formation of sub-teams to work on particular issues can help alleviate this problem. While co-location facilitates open communication; it does not guarantee the channels of communication will always function as intended. Therefore, the people in the IPTs must have the interpersonal skills necessary to work in a team environment as well as the proper information technology to compensate for the inevitable TDYs and schedule conflicts.

c. Team Leader: It is extremely important that an IPT have an identified team leader. The role of the team leader is to keep the ream focused on integration and decision-making. Consensus decision-making is encouraged, however, when this is not possible, it is critical for all team members to know how decisions are being made. The leader acts to facilitate the efforts of the team toward accomplishing some specific measurable performance objective (product goal). The selection of an effective team leader is crucial to the successful functioning of the team. While some individuals can be good managers or experienced technicians, they may not be able to function as an effective leader of an IPT. There are various methods used to select a team leader, i.e.. the next level supervisor appoints someone, the process owner selects one, or the team members nominate a leader from their team to the next level supervisor. The method used should be agreed upon between the leadership in the organization. Whichever method is used. there are several factors that should be considered when selecting a tearn leader.

(1) Team player. The team leader should guide, encourage and coach the team's operation. The team leader should have the attributes of effective leadership: tact. diplomacy,

competence, and the ability to listen and move the group towards consensus. The leader should help the team to achieve balanced, integrated decisions without dominating the process. Simply put, the team **leader should** have the basic skills **and** energy to initiate and sustain action translating intention into reality. The team leader should participate as a full-fledged team member.

(2) Communication skills. The team leader should-be an effective communicator. The leader should be able to actively listen to his/her team and advocate the team's conclusions to others while working effectively within the next higher level IPT in the organization. The team leader should promote a process of ongoing improvement of how the team works to achieve greater throughput and publicize the team's successes.

(3) Broad knowledge. The team leader should be familiar with the various functions that affect the performance of the product the team is responsible for. This will enhance the cross-functional interaction within the IPT and help ensure that the decision making process does not become dominated by one discipline.

(4) Point in Product Life Cycle. The product's position in its life cycle, as well as the prominent functions involved with the product at that time, should be considered when selecting a team leader. This approach encourages transfer of team leadership to other functions as the product evolves.

d. **Team Leader Position.** The team leader may or may not be the supervisor of the team members.

(1) If the team leader is also the supervisor, the leader assumes the normal personnel duties such as writing position descriptions and work plans, assigning and reviewing work, conducting appraisals, approving training, and related duties.

(2) In many instances the leader does not officially evaluate members. but rather provides inputs to the lead functional staff for each functional member on the team. Each staff functional rates the team members they are responsible for.

(3) In any multidisciplinary team, there will be a collection of different supervisory relationships. It is critical that the team leader works effectively with all functional staffs to ensure that appraisals, training and other support functions are effectively managed.

(4) When establishing teams and team leader positions, it is essential that the organization work proactively with its servicing personnel office to ensure that all positions are properly classified.

e. Other Roles: Of significant concern to the team is who directs their overall work, who are their primary customers, and who are their primary suppliers. The roles and responsibilities of each stakeholder beyond the team itself, both internal and external to the organization, must be defined and understood by all those involved.

4. **Establishing Teams.** When an organization decides to establish teams. it is- important to collect lessons learned from other offices that have undertaken similar changes to ensure the organization is truly implementing IPD in the most effective manner. Teaming should not be used to justify growth in manpower, but rather result in a more efficient use of existing resources. Several factors are consistently related to the success of IPTs.

a. Each team should develop, with higher level management involvement. a charter that defines its mission, levels of authority and responsibility, team membership, specific relationships with other groups, goals and objectives for the team, and boundary conditions that define the scope of the team.

b. Teams will find it effective to participate in a team building activity that helps them clarify the initial relationships both within the team and between the team and its primary stakeholders. During this team building session the team should develop a set of operational norms that define how they intend to organize and communicate. Also during this session, the team should begin charter development. clarifying their goals and objectives, and formally identifying their products **and** services. Several sources for outside help in conducting a team building session are available. (Organizations are encouraged to call their servicing Total Quality or Organizational Development office for assistance.) However, effective teams. guided by appropriate performance standards, not abstract commitments to teamwork or empowerment, are the real drivers of organizational performance.

c. A key aspect of IPD is the training of the individuals for their roles as functional experts on the teams. as well as training in quality and IPD concepts.

d. In order for the IPT to be truly effective. it must be empowered. This means the team is given the appropriate resources, authority, and decision making responsibility necessary to manage and produce its product. In return, they must accept the team as well as individual responsibility and accountability for their products and channel their energy toward team achievement. A part of empowerment includes keeping all involved stakeholders informed of the status, progress and potential issues of the team and their products.

CHAPTER 4. METRICS - IPD EFFECTIVENESS

1. Introduction The AFMC commitment to continuously improve our processes carries with it a responsibility to provide a quality product on schedule for an affordable price. This is not easily done nor is it to be taken lightly. This chapter will define what metrics are and why we need them. It will also explain the metric model and define the command team implementation metrics as they relate to the eight IPD tenets. And last. this chapter includes the eight attributes of a good metric and the eleven steps to metric development.

2. What are Metrics? Metrics are meaningful measures. They are also snapshots in time that measure how well we are doing. That implies several things. First and foremost, since IPD is service oriented towards one or more customers, our metrics must be formulated with the customer in mind. Second, metrics must communicate the health of a process. Third. the metric must distinguish "health" from sickness. To know what health means, we need to estimate how well we're doing against what we planned to do. Fourth. a time dimension is necessary to distinguish trends - good or bad.

3. Why are Metrics needed? Metrics help us define our problems by fostering process understanding and motivating us to take corrective action. Secondly, metrics serve as controlling measures to help us understand where and how pitfalls adversely impact our process analyses. And ultimately we then use metrics to help us improve the way we do business, For a metric to be meaningful, it must represent a cause and effect relationship with the desired work product or work behavior that we want to measure. As a result, it gives us the data that allows us to take action and achieve our desired outcomes.

4. Metrics Model

a. The metrics model described in Figure 4- 1 can be used at any level within the Command to determine significant trackable events. IPD centers on the efforts of the team. The team can track its effectiveness as (1) the team - by asking themselves if they have metall exit criteria (2) the processes - as the team focuses on the product, and (3) thr evidence - have or have they not made improvements by measuring customer satisfaction with the end product. process, or service.

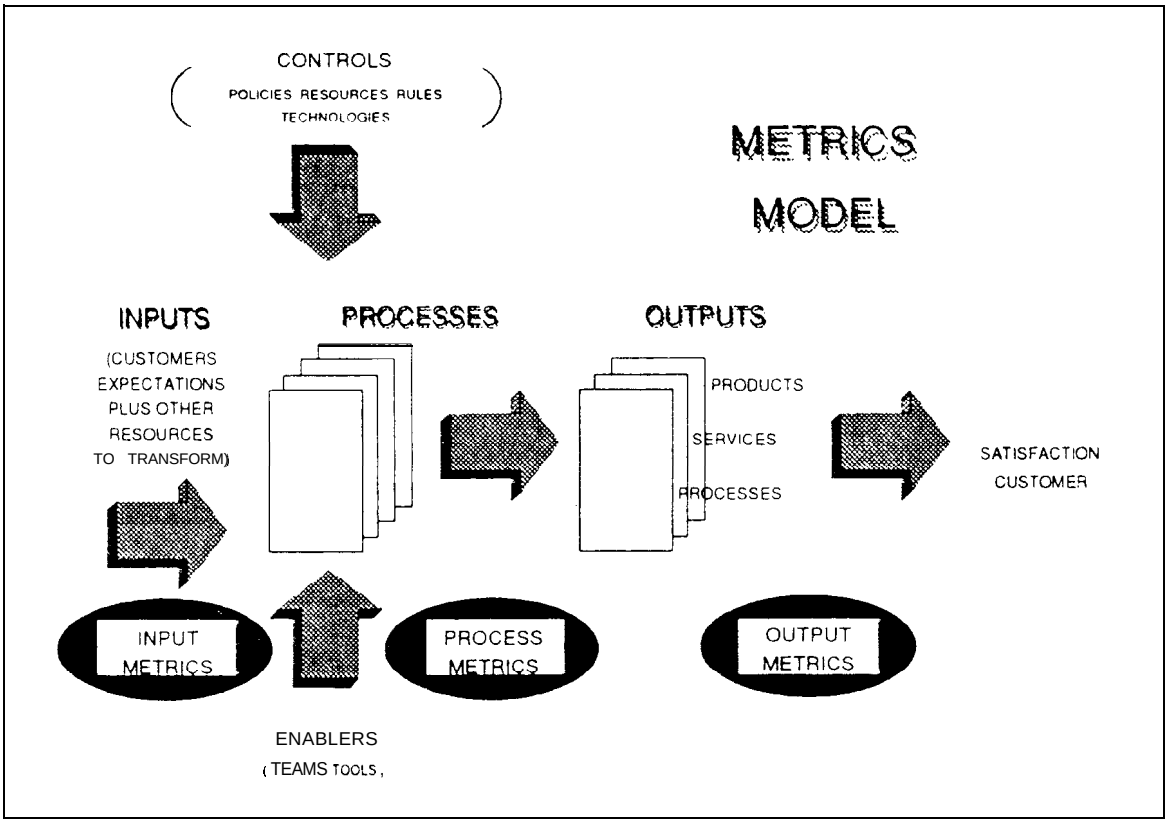

Figure 4-1

b. Inputs (requirements) by the customer drive us to do something - build a plane, repair parts, provide a service. Once the customer makes the requirements known, it is then incumbent upon us to provide the right people, at the right place, and at the right time, to produce the right thing.

c. There will always be constraints that force us to analyze all of the tradeoffs. We then select the best alternative by empowering our teams to analyze those processes that best produce or improve their product. After the product is produced, we then look for customer satisfaction.

5. Attributes of a good metric: (See note 1at the end of the chapter) The first and foremost attribute of a good metric is it helps the organization or team. Other basic characteristics of a good metric are:

a. It is accepted as meaningful to the customer.

b. It tells how well organizational and team goals and objectives are being met through processes and tasks.

c. It actually measures what you want to measure (is it valid?) and measures it consistently over time (is it reliable?).

d. It shows a trend.

e. It is unambiguously defined.

f. Its data is economical to collect.

g. It is timely.

h. There is a cause and effect relationship between what you measure and what you want to do with the information.

6. Steps to Metric Development

a. **Step I. Identify your purpose.** It is important to first align your purpose with your organization's mission. vision, goals, and objectives. These should be inextricably linked to meeting customer needs and serve as a foundation for accomplishing and sustaining continuous, measurable improvement.

b. **Step II. Develop your Operational Definition starting with your Customer** Define the who, what, when, why and how of this metric in sufficient detail to permit consistent, repeatable and valid measurement to take place. The operational definition starts with an understanding of your customers' expectations. You then "operationalize" the expectation(s) by defining characteristic(s) of the product, service, or process which are internally measurable and which, if improved, would better satisfy your customers' expectations. This is actually an iterative process involving Step II-VIII. This is the first element of your metric package.

c. **Step III. Define what it is that you want to measure.** Before looking at existing or new metrics. identify what it is that needs to be measured. First, determine where you are and where you want to go before applying any measurements. This means you need to be aware of the Command goals. organizational goals and appropriately developed team goals. Two tools that can help accomplish these tasks are Theory of Constraints (TOC) - to determine where you are and where you want to go - and Quality Function Deployment (QFD) - a process that integrates customer requirements into the design and development of a product, another process, or service (See note 2 at the end of the chapter).

d. **Step IV. identify and examine existing measurement systems.** Once the link to objectives and goals has been established, it is essential to determine if existing metrics or other measurement systems exist that satisfy your requirements. Don't "reinvent the wheel." Use existing input/process/output measurements when they exist.

e. Step V. Generate new Metrics if existing metrics are inadequate. Most measurements used in the past were not necessarily process oriented. -They were results indicators related to final outputs, products or services for external customers. With metrics. the focus is on how processes are performing in making these final outputs. We are interested in those upstream process measures which drive the final outcome and are the key to making process improvements. The assumption is: if process performance is controlled and improved. the quality of the products and services will follow suit.

f. **Step VI. Hate your Metric against the "Eight Attributes of a Good Metric".** Refer to the attributes listed above. If you feel your metric sufficiently satisfies these criteria for a good metric, go to Step VII. If not, return to Step II and correct the deficiencies.

g. Step VII. Select appropriate Measurement Tools. Select the proper tool for analyzing and displaying your data. There are numerous books and pamphlets and mission element board metrics that may apply to your situation. Use whatever you feel is best.

h. **Step VIII. Baseline your Process.** Start acquiring metric data. This serves as a baseline for determining your process capability. Ask if the data is accumulated over time and adequately measures the important characteristics of your process. If the answer is uncertain or does not appear as a useful tool for managing what it is you want to manage, then develop a new, better metric.

i. **Step IX. Collect and analyze Metric data over time.** Continue aggregating metric data over time. Examine trends. Special and/or common cause effects on the data should be investigated and assigned. Compare the data to interim performance levels. This is the second element of your metric package.

j. Step X. Finalize the Metric presentation. Based on the results of the previous steps. you are finally ready to present the metric externally. The descriptor will provide enough information to communicate the appropriate details of the metric to your customer. This information should be an abbreviation of the key elements of the operational definition. The graphic presentation clearly and concisely communicates how you are performing based on a standard and where you want to go. This is the third element of your metric package.

k. **Step XI. Initiate Process Improvement Activities.** Initiate process improvement activities in conjunction with the key process owners. Once improvements have been implemented. the process above may start over or it may pick up again at almost any step.

Remember, continuous improvement requires continuous effort. THIS STEP IS THE MOST CRITICAL FOR YOUR IMPROVEMENT EFFORTS TO BECOME A REALITY. Remember that metrics are just a means to an end! That end is continuous process improvement.

7. Linkage to Command Goals

a. As a service organization, AFMC success is founded within the customer focus. The following two AFMC goals are much more achievable with IPD implementation:

(1) Satisfy our customers' needs...in war and peace

(2) Enhance the Excellence of our business practices

b. The greatest benefit we see with IPD implementation is an increase in "Users' Satisfaction." Our services, products and processes will improve in quality. be more timely. and hopefully cost the customer less. A command level goal already exists to measure Users' Satisfaction. As a way of measuring IPD effectiveness, that goal will be tracked to see if the Users' Satisfaction is in fact increasing with IPD implementation. The second goal is being tracked through the Integrated Weapon System Management metrics.

8. Metrics Approach

a. With the significant variations in approaching IPD strategies across the command, it is incumbent upon each program, product, process or service leader to carefully develop metrics that will indicate effectiveness and/or performance relative to their unique situation. Metrics are dynamic. Metrics at every level should be periodically reviewed as processes improve and change or as customer needs change to be effective.

b. Additional metrics can and should be used as tools at all levels - including teams -to ensure IPD effectiveness. This guide provides a basic model and a number of potential metrics in the attached models. It is within the discretion of each organization to determine if existing metrics meet your needs or if new ones need to be developed. Rest assured, opportunities to explain and examine IPD effectiveness will abound.

9. IPD Implementation 'Tracking

a. Metrics showing the initial IPD implementation will be used to measure the initial AFMC goal of implementing IPD command wide. These metrics are three-fold:

(1) Have single managers addressed IPD in the IWSM CONOPS?

(2) Have single managers included IPD in their IWSM Plan'! (not to be confused with the IWSM Master Plan)

(3) Are single managers, staff and service organizations evaluating processes using the IPD tenets'!

b. When preparing the CONOP and IWSM Plan consider the following:

(1) How have you identified your customer?

(2) How have you identified your products, processes. and constraints'!

(3) How have you empowered your people'? Have you defined a tool kit? Have you defined their authority/limits'!

(4) Do you need to change your organization, now or later?

(5) Are there any issues/constraints which prevent you from full implementation of IPD'?

(6) What best practices have you developed in your implementation of IPD?

c. Subparagraphs 9a(1) and (2) above are compliance driven and are mandatory entries in both documents. Single managers shall address how they plan on using IPD in their IWSM CONOPS and then expand on the who, what, when, where and how in the IWSM Plan. These documents are approved at various levels but must be reviewed by HQ AFMC.

d. Subparagraph 9a(3) centers on process improvement by implementing IPD within any given organization. The common denominator throughout the Command is the IPT. When a single manager or process owner puts an IPT together to analyze a particular process then we have the basis for IPD implementation.

10. Evaluation of IPD Implementation. Using the scale in Figure 4-2, a single manager. process owner, or team leader can evaluate their IPD implementation.

IPD TEAM IMPLEMENTATION SCALE

Little or no IPD involvement	Planned Course of action	Totally IPD Structured

1 — 2 — 3 — 4 — 5 --- 6 — 7 — 8 — 9 --- 10

Figure 4-2

a. On a scale of 1 to 10, with 1 being little or no IPD involvement and 10 being totally IPD structured, rate each tenet based on the aggregate average score given to each tenet question (in paragraphs 10.c.(1) through 10.c.(8) below). After averaging each tenet, average all the tenets for an overall score.

b. For example. if tenet number one is rated 5, 7, 6.4 and 3 for each question respectively, the average score for tenet one is an overall 5. Now average all of the tenet scores (e.g., Tl-5, T2-6, T3-4, T4-2, T5-3, T6-5, T7-6, TX-4). Total average for all tenets is 4.40 (rounded up). This means that the team, in this example, has achieved approximately 45% implementation of IPD.

c. Don't intentionally over or under rate the organization or team. We know there is pressure to show IPD progress, but an honest subjective assessment will heip each team establish a baseline or standard for each tenet.

(1) **Cultural Change -** Embracing the IPD philosophy requires purposeful, multi disciplined teamwork. The sequential thought process for implementing IPD should be: (1) the customer, (2) the product, (3) the process, (4) constraints and (5) organizational structure.

(a) Are single managers or process owners responsive to customer priorities'!

(b) How are the team members efforts tied to the process of ongoing improvement and delivery of product(s), process(es) or service(s)'!

(c) How are processes exploited to increase their ability to achieve team goals, reduce the amount of internal resources and reduce costs'!

(d) Are the constraints to the product and its development/delivery being identified and worked'?

(e) Is the IPD team organizational structure responsive to customer needs'?

(2) **Product Focus** - IPD requires a product focus and a complete understanding of the processes to optimize the product.

(a) Have all customers (both internal and external) and their requirements/expectations been identified and validated?

(b) Identify the product and analyze the necessary processes to determine the best tradeoffs.

(c) Are costs, schedule, quality and performance continually monitored?

(d) Identify and eliminate all nonvalue added work or scrap.

(3) Up-front Planning - The life cycle of a product or process will be integrated through comprehensive, up-front planning that must include all functions. customers, and suppliers.

(a) Has a concept of operations (CONOPS) or equivalent document been developed and approved that addresses the total life cycle of the product. process or service'!

(b) Do internal and external customers play a key role in the planning process'.' Who are your customers and what roles do they have in the planning process'.'

(c) Identify key program elements.

(d) Have sufficient resources been validated and funding constraints identified?

(e) Have all eight primary system functions been considered (i.e., development. manufacturing, verification, deployment, operations, support, training and disposal)'! How do they apply'!

(4) **Right** People, Right Place, Right **Time -** All functions that impact the achievement of the customer's requirements should be applied concurrently. in a team fashion, throughout the life of a product or process.

(a) Is the necessary functional expertise available to participate in the IPD team effort?

(b) Are the team members actively participating in the analysis, problem solving, and subsequent product delivery?

(c) Are customers and suppliers a part of each team? How do they interface with the team'.'

(d) Do team members have the appropriate skills (functional, interpersonal, problem solving) as the product and its requirements evolve over the life cycle'!

(5) **Teamwork and Communications -** People must function as a team. Team success, facilitated by rapid, open communications, must be emphasized and rewarded. Management relationships must be developed which are consistent with and focused on achieving the team's measurable goals and objectives.

(a) Does the team hold regular meetings in which team member viewpoints arc honestly put forth'?

(b) Are team achievements recognized and rewarded?

(c) How are team goals and objectives developed which relate to the product?

(d) Has the team focused on using metrics which drive them towards continually improving their processes in line with the product?

(6) **Empowerment-** Decisions must be driven to the lowest possible level commensurate with risk. Resources should be allocated at levels consistent with authority, responsibility, and the ability of the people.

(a) Do IPD team members have direct input concerning decision making in regards to product or processes they supply?

(b) When and how do single managers and process owners periodically review decision authority, responsibility, and accountability levels of their IPD teams?

(c) How are team members contributions valued by the organizational leadership'!

(7) **Seamless Management Tools -** A framework must be established which relates products and processes at all levels to demonstrate dependency and interrelationships. This hierarchical interrelationship must be understood and appropriate partnerships established to ensure that all decisions are optimized toward the ultimate user's end product.

(a) Have the necessary tracking mechanisms been identified and established'!

(b) Know available information systems -- are they adequate to aid in team decision making?

(8) **Integration Throughout the Life Cycle -** IPD will encompass all products and processes, regardless of the point in their life cycle.

(a) What are the team owned processes and have they been validated?

(b) List the team owned products or services.

(c) Does the team understand the need for life cycle planning and the evolutionary changes that occur over time?

(d) Has the team anticipated the customers' long range needs - what are they?

Note 1 - Excerpts from **The Metric Handbook,** AFMC Pamphlet 74-Y. 26 March 1993, were **used** in part for the attributes of a good metric and the steps in how to develop good metrics. This is a good reference document to help the single manager or process owner start developing the right types of metrics.

Note 2 - Quality Function Deployment (QFD) is a process that integrates customer requirements into the design and development of a product. another process or service. **As such, it is a structured. customer oriented process for determining. assessing** and prioritizing system and product level organizational metrics. The basic methodology of QFD is to identify specific "whats" or the customer and translate those items into "hows". As the two **lists** are developed, the interaction between the two elements is determined and the people tasked to develop the metrics attempts to quantify the basic nature of what their customer "wants". They then develop lists of "hows" which will meet the "wants" (expectations) of the customer.

CHAPTER 5. EDUCATION AND TRAINING

1. Introduction

a. The purpose of this section is to provide a frame work for people to think about the kinds of skills they need. The intent of the framework of the skills needed in order to successfully implement IPD. The framework should be used in the development of an education and training plan.

b. If IPD is to become the new way of doing business in this command., then education and training must support this change. The focus of training should be on providing the skills to work more effectively to produce better products as a team.

2. Framework

a. The people in IPTs need, to differing degrees, functional or technical knowledge, an understanding of the IPD philosophy and IPD tools. the interpersonal skills to work as a team, and decision making/conceptual skills necessary to analyze dynamic systems, evaluate alternative courses of action, and cause the required changes.

(1) **Functional or 'Technical Knowledge.** Functional knowledge refers to the fact that people must have the technical skills to produce their organizations product:, and/or services. It refers to the understanding of, and proficiency in, a specific functional area. It involves specialized knowledge, analytical ability within that specialty, and the ability to use the tools and techniques of the functional area appropriately.

(2) **IPD Philosophy and Tools. IPD** Management system skills refers to the fact that people need to know the philosophy and tools of IPD (IMP, IMS, etc.) and how they relate to provide the organization's product(s) and/or service(s).

(3) **Interpersonal Skills.** People must have the interpersonal skills to be an effective team member and be able to build cooperative effort within the team he/she may work with. in, and/or lead at the time. More specifically, internal intragroup skills are essential in lower and middle management roles and that intergroup skills become increasingly important in successively higher levels of the IPT structure

(4) **Problem Solving Skills.** Teams must be able to identify the problems and opportunities they face within their system in terms of the root and common causes of each. Individuals must have the conceptual skills to recognize the interrelationships of the various factors involved in his/her system. Central to this is the ability to identify the cause and effect

relationships which exist between problems in the system as well as the opportunities which present themselves. People must be able to decide what to change, what to change to, and how to cause the change in the most effective and efficient manner possible.

b. There are numerous courses within the DOD and the commercial sector which, when taken, result in the appropriate knowledge, interpersonal skills and decision making skills to one degree or another. By using this framework, people can utilize the education and training opportunities they need to develop the skills they actually use rather than just taking courses.

c. Existing programs and organizations such as APDP, AFIT, SAS, and DSMC will continue to provide the basis of the technical knowledge for functional and technical areas; TQ or Organization Development Offices will continue to provide courses in interpersonal skills as well as specialized TQ decision making (QFD, etc.); The management system skills of IPD (IMP, IMS. etc.) will be incorporated into existing AFIT and DSMC courses as much as possible. New courses transferring these management system skills will be developed as appropriate.

3. **Sources fur Training**

a. A basic understanding of IPD can be gained through the following sources:

(1) IPD Letter, 13 Jan 93 (Attachment C-2)
(2) IPD White Paper, 21 Apr 93 (Attachment C-4)
(3) This Guide
(4) Maj Gen Fain Video (PIN 61213.5 DF) - IPD Philosophy as given to Center CCs
(5) AFMC Center CC's briefing
(6) Site specific briefings and examples
(7) Workshop for Center Focal Points to be held 29-30 Jun 93

b. Air Force and DoD educational institutions (AFIT, SAS and DSMC), with the help of the IPD Working Group and Steering Committee, are developing courses on IPD and incorporating IPD concepts into their existing courses.

c. Several contractors have developed, or are developing courses to educate AFMC personnel in IPD. While support from a contractor may be necessary, no one can define the desired organizational structure. roles, and responsibilities, or degree of empowerment, other than the organization implementing IPD. When initiating an education program for a given organization, review other organizations that have already implemented IPD, provided the application of the IPD tenets are tailored appropriately to the new organization.

d. Each center has an IPD focal point as well as TQ or Organization Development Offices. These people are an excellent source of information and courses to develop the appropriate

skills. Any organization that cannot locate their focal point. or that has additional questions. or suggestions, can contact HQ AFMC/XR.

ATTACHMENT A. IPD MODELS

This attachment contains various models that explain how IPD is applied to products in different environments. The models vary in level of completeness and will be refined as part of a continuous improvement effort.

Contents: Page

ATTACHMENT A-1. ACQUISITION/MODIFICATION/SUSTAINMENT

1. The model in figure A- 1 applies to all phases and activities of acquisition and sustainment performed throughout AFMC. As the weapon system progresses through its life cycle, the specific activities. types of decisions. and many of the tools will change and evolve. While the Mission Need Statement may be the statement of requirements early in the life cycle, trends may indicate a different type of requirement during operations and maintenance. The design engineering process may dominate activities early on but Programmed Depot Maintenance may be the lead activity for most of a weapon systems' life. Figure A- 1 shows some examples of these processes, tools. and products. The following discussion describes how the generic IPD model can be applied to weapon system management

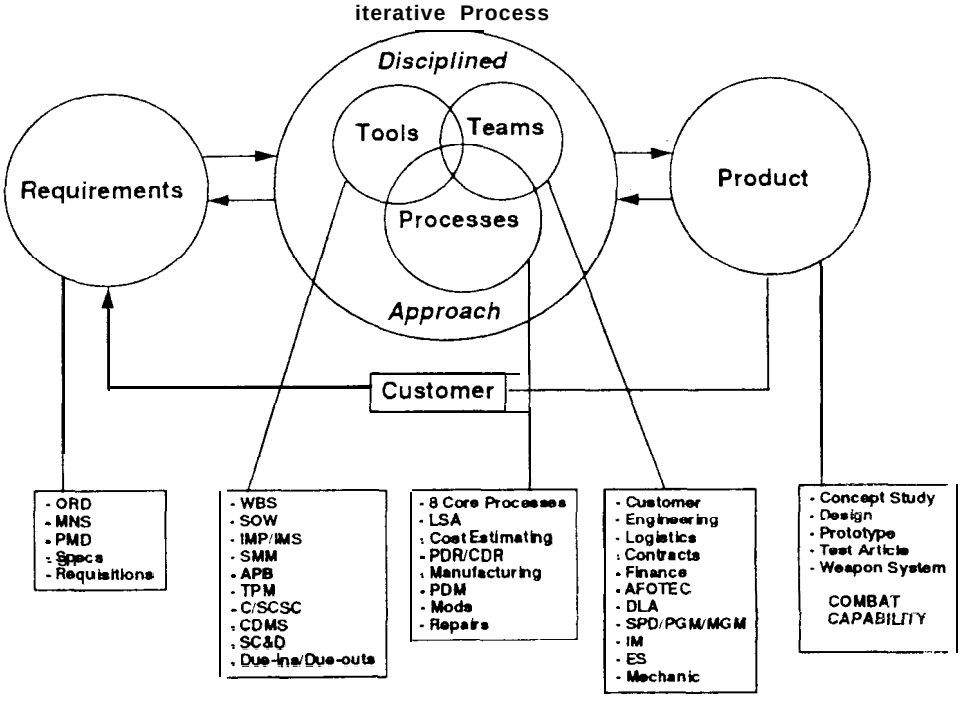

Figure A-l

a. Requirements. The weapon system user first establishes the need and initial requirements for the system. At Milestone 0, requirements are stated as mission need: in the Mission Need Statement (MNS). Phase 0 activities then center around exploring concept alternatives and defining requirements to move to a Milestone I. Resources are always constrained in the national defense arena. It is, therefore, essential to understand the core requirements of the user. When the core requirements are understood and agreed upon, cost and design trades can be effectively conducted and alternative options explored. 'The key here is to interactively and iteratively explore the core requirements and solution with the customer As appropriate, coordinate with the intelligence community upfront to ensure you have the latest identified threat information.

b. Tools. Assembling the various elements of the program management information systems used to run acquisition and sustainment programs into a coherent "tool kit" is an essential ingredient for producing empowered teams and integrated decisions. The tool kit should ensure that team members know what data is needed to manage their product, how to get the data, and how to use it to make good integrated decisions. Some of these tools, such as the Integrated Master Plan (IMP) and the Integrated Waster Schedule (IMS), integrate different

types of data into a single source document. Others, like the Concept of Operations (CONOPS) and the Program Objective Memorandum (POM), contribute to the seamless management environment that applies across the life cycle under the IWSM approach. All tools **used** in the IPD approach are "value-added" tools. They aid directly in the planning, tracking and execution of program activities. The IPD approach also blends these tools into a single integrated management process. The net result is a single, cradle-to-grave, integrated management system.

c. **Teams.** The next ingredient of the disciplined approach of IPD, the one that makes it all work, is the IPT. These are the people who will make effective life cycle decisions for the weapon system. Because the activities relative to a weapon system change and evolve over its life, team membership and leadership should likewise evolve. While acquisition planners and design engineers may be the most prominent members early in the life cycle, provisioners and item managers gain a bigger voice during engineering and manufacturing development. Equipment specialists and mechanics may be the lead members during the operations and maintenance phase, with the design engineers returning once again if a major modification is needed.

d. Processes. The processes of this command are many and diverse. They are the unique methodologies and techniques which AFMC contributes to the overall warfighting capability of this nation. They include the eight IWSM core processes (i.e., Product Management. Requirements, Systems Engineering/Configuration Management, Financial Management. Contracting, Technology Master Process, Logistics, and Test & Evaluation) as well as major activities like designing new weapon systems and repairing existing systems and the procurement of piece parts. The processes are quite literally everything that we do. They are what we own and how we influence the product. We should continually analyze our processes for continuous improvement. The tools of the system are the way that we track the effectiveness of our processes.

e. Product. The desired end product of weapon system management is combat capability in the hands of our operational users. The intermediate products that result from each phase of the life cycle (e.g. designs, prototypes, and systems and subsystems) that result from the application of the IPD approach should produce that combat capability with minimum cost and in minimum time

f. Feedback. Continuous feedback on the health of the weapon system. through the operational user, is essential. Accepted metrics, such as cost, schedule, performance and supportability indices, provide the feedback on the achievability of the user's stated requirements.

2. **General Principles.** Essential to the implementation of the IPD phiiosophy is the establishment of a management framework. This IPD framework can be applied to each phase of

the weapon system life cycle. To understand how this common framework applies to each phase, the phases can be thought of as consisting of the same 5 basic steps as illustrated in figure A-2. The 5 steps are: (1) determine requirements, (2) outline the program, (3) plan the program, (4) allocate resources, and (5) track and execute the program. The framework developed and established through these steps organizes and integrates the processes described in the generic model. The following sections describe the implementation of the IPD framework through this five step flow. A project officer and/or IPT should be able to follow the process presented to conduct an acquisition, modification or sustainment program that is well planned out and implements the IPD philosophy.

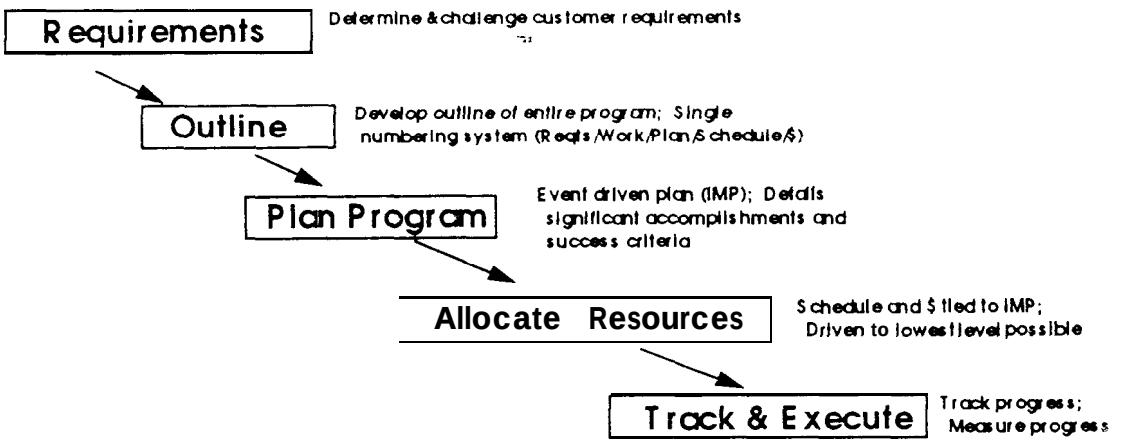

Figure A-2

a. Defining the Requirement

(1) Establishing customer requirements. The requirements process begins by identifying your customers. The most obvious customer is the organization that will actually operate the system in the field (e.g. ACC, AMC, AFSPACECOM). Customers can be divided into two general categories - internal and external. Internal customers are those from within AFMC like the headquarters, local staff agencies or a technological repair center. External customers are those outside of AFMC like the operator. OSD, FMS or the contractor.

The next step is to understand the requirements of the customer through a process which refines these requirements in light of the available time, funds and technology. The requirements refinement process begins with establishing an initial requirements baseline and then comparing this against resources available. These requirements may be spelled out in the MNS and the Operational Requirements Document but they must be linked to certain resource levels for the program to be viable. As soon as any one of the resources or requirements

change, everything must be changed in concert. Other requirements are based on an analysis of existing system support categories. These include repair. material and engineering support.

Customer requirements at logistics centers fall into three generic categories. Logistics centers provide repair capabilities, manage and procure items, and provide sustaining engineering to support existing equipment.

Repair requirements are defined through the various engineering and management processes using failure data and engineering analyses is jointly developed by the customer and the ALCs. For example, component repair requirements are based on accumulated field failure data which is then translated into the quarterly repair requirements. Aircraft Programmed Depot Maintenance (PDM) is based on an engineering analysis (Aircraft Structural Integrity Program). Other equipment have similar processes to determine repair requirements.

Item procurement requirements are based on failure data generated by the customers. This results in the purchase of material that is both reparable and consumable. All product and material groups are included. Equipment (support equipment, vehicles, ground radars, etc.) is replaced because it is no longer economical to repair. Recoverable items (avionics, engines, landing gear, radios, etc.) are procured because they can not be repaired. Finally, consumable material (munitions, bits and pieces, tires, etc.) are bought because they cannot be repaired.

Every aspect of the weapon system support requirements process is supported by sustaining engineering. This includes support to the PDM process, item failure analysis, and modifications which support new capabilities and correction of existing deficiencies. PDM support was covered under repair. Failure analysis supports changes to repair techniques in the depot and field. changes to technical data, and overall support concept. Finally, the customer and the ALCs jointly develop changes to existing capabilities to correct deficiencies and **propose new** operational **enhancements** as modification **candidates.**

The key to effectively gathering requirements from any customer is communication. It is important to develop a strong team relationship with all customers so that the flow of information is not only timely, but useful. Spending the time up front to get good requirements will save countless days downstream trying to compensate for a customer requirement that was omitted.

(2) **Translating customer requirements. You** should concentrate on documenting the minimum requirements necessary to field the system. Requirements should be performance-oriented and identify the minimum requirements **needed** to field the system. This will give the program the necessary flexibility to design the best system. You should avoid "how-to" types of requirements that constrain the program unnecessarily. A performance oriented structure which uses the MIL-STD-490 specification philosophy will form the baseline for the program. This structure will be the basis for all management activities.

b. **Outlining the Program**

(1) Product identification. The next step in the acquisition or modification process is to outline the program with respect to the products of the system. One of the fundamental tenets of IPD is product orientation. where all activities in the program are focused on the products that are actually delivered to the customer. When you are outlining the program in this fashion, understand that you are making certain preliminary assessments. Among these are organization and interdependence of systems and subsystems. The products should be broken out to a level commensurate with the risk associated with developing, acquiring or supporting the product. In the acquisition process, this breakout is usually first identified in the specification tree and formalized by the delivery of system segment specifications that allocate the system-level requirements to the appropriate products. A sample breakout from the Brilliant Eyes program is provided in Figure A-3.

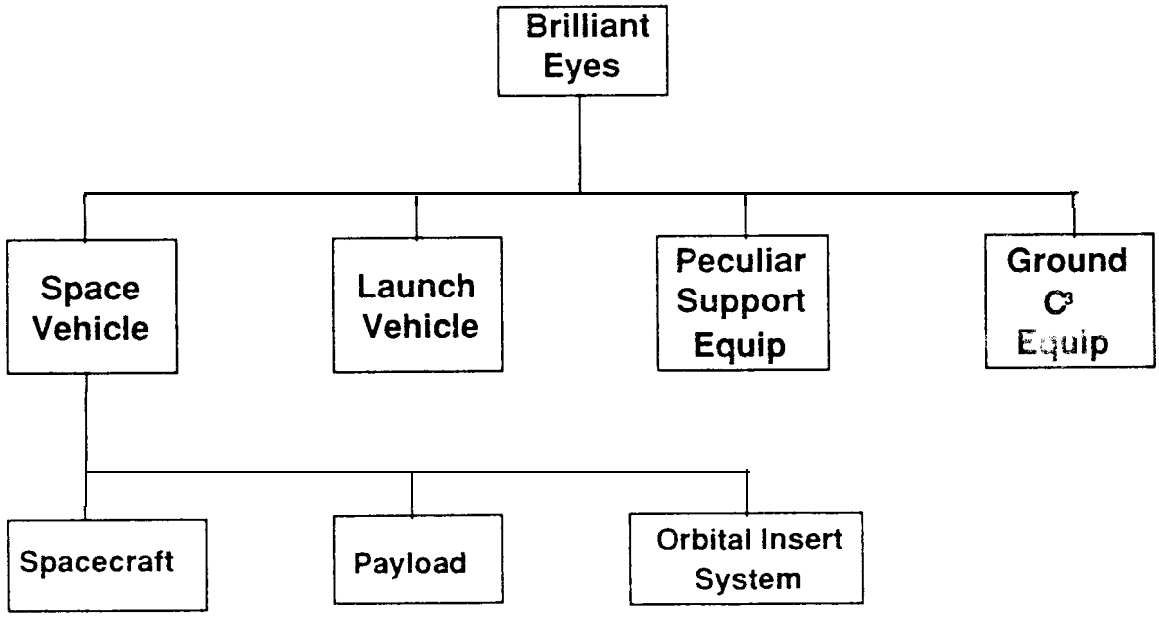

Figure A-3

As the management of a system evolves through its life cycle, the roles and responsibilities for different items within the system will change. During the initial phase of the acquisition process, Product Group Managers (PGMs) and Materiel Group Managers (MGMs) may not be involved extensively; everything is managed under the SPD. As the system evolves and matures, PGMs and MGMs will get more involved as the sub-products are consigned away

from the SPD to the PGMs and MGMs. In the case of a sustainment effort, like the F- 1 11, the SPD/PGM/MGM relationship exists as illustrated in Figure A-4.

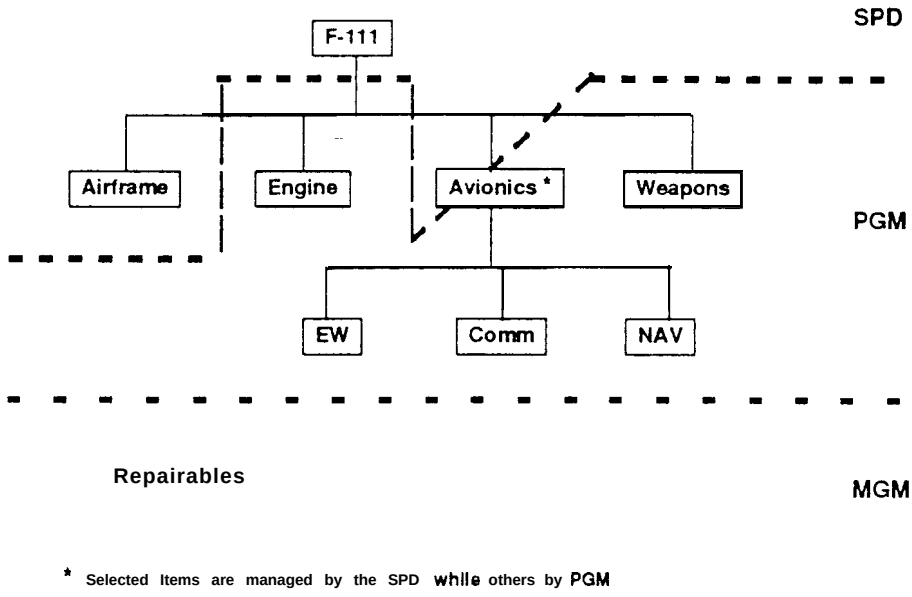

Figure A-4

PGMs deal with the major subsystems and equipment that are not stand alone systems. Examples include guided munitions, radar sets, ground and airborne segments and test equipment. Many PGM items are called Other Major Equipment Items (OMEI). These are, in many cases, integral to a system. In other cases they are separate but are used on or with systems. MGMs deal with the items that are major components of a product group or system. in most cases they are items that support a specification configuration controlled item. Configuration control for these items is usually maintained by configuration control 'of an engineering data package. In most cases this level of equipment is either supported as a reparable or consumable item. e.g. an item that is supported by Management of Items Subject to Repair (MISTR) versus an item that is thrown away when it fails.

The program's Work Breakdown Structure (WBS) should be aligned directly to the product breakout to provide management visibility to the IPT responsible for the product. As directed by DoD 5000.2 and MIL-STD-XX 1, all program activities are ultimately tied back to the WBS. The WBS should also identify the management processes required to integrate the products at each level into the next higher level product. In MIL-STD-881, examples of the integration elements are system engineering, program management, system test and evaluation, and integration, assembly, test and checkout. A WBS philosophy is also applicable to our

Logistics Center products and processes. This is based on two factors. First, being that systems and equipment were developed using the WBS structure which flowed into the logistics system structure (specifications, tier down to engineering data packages for items). Second, the logistics systems are based on a hierarchical order of items, subsystems and systems which roll up and tier down the equipment and process data systems.

The WBS should also establish a single numbering system that will tie all the tools used in the management of the effort back to the products of the program. The single numbering system is a simple but effective integration tool. It's a technique that allows immediate identification and tracking of requirements to processes to resources in a vertical and horizontal organized fashion. An example of the WBS and numbering system used in the Brilliant Eyes program is shown in Figure A-S.

Example Work Breakdown Structure

00000 Brilliant Eyes System

10000 Systems Engineering/Program Management

20000 Space Vehicle

2 1000 Spacecraft
22000 Sensor Payload
23000 Integration, Assembly, Test and Checkout
24000 Orbital Insertion System

30000 Launch Vehicle

40000 Peculiar Support Equipment

50000 Ground Command, Control, Communication and Mission Equipment

Figure A-5

(2) **Building a product-oriented organization.** Establishing a preliminary product-oriented organization is the next step in the process. If you are working on a new acquisition or modification program, the initial work to establish the requirements and identify

the products was probably performed by a small cadre of people. Now is the time to identify the teaming structure that will perform the remainder of the planning and actually manage the effort. The teaming structure should be based on the guidance found in Chapter 3.

c. Planning the Program

Another key tenet of IPD is upfront planning. When this planning is conducted in a cross-functional manner, improvements in quality and reductions in downstream changes can be expected. On new acquisition and modification programs, this planning should be conducted by the government and supplier IPTs prior to awarding a contract to perform the required effort . This planning effort should be included as part of the IASP. Use of the Air Force Acquisition Model may aid in this planning. This will help avoid difficult changes to the contract after award and ensure that the contractor commits to an executable program. Existing programs should ensure that the planning for all future efforts is conducted by the IPTs.

The goal of the upfront planning activity is to define the core program that must be accomplished. This core program consists of those tasks required to complete the effort and deliver a product that meets the needs of the customer.

(1 j **Defining the core program. The** definition of the core program begins with the identification of key program events. These events should represent the milestones for program maturity. The character of each event is dependent on the phase of the program. For instance, a key event during the design phase might be the critical design review while a key event during production might be the completion of acceptance testing. Events may also be on a recurring or nonrecurring basis. For example, there may be key events during the production phase that will recur each time the system is manufactured. In new acquisition or modification efforts, the minimum set of events acceptable to the government should be provided to the contractor in the RFP. The offerors will then add key events to the list as required by the unique system they are proposing. Existing programs should have already identified the key program events. They are usually reflected in the milestone schedules maintained by the program office and contractor.

Once the events have been established, you should define the work that must be performed to support each key event. This work should be defined by product using the numbering system from the WBS. Each IPT should prepare the tasking for its product. The tasking for each product should be cross-functional in nature and cover all work that must be performed on that product. This tasking will serve as a major element of the tool kit that each IPT will use to manage the contract after award.

In a new acquisition, modification program or repair contract, this work is defined in the Statement Of Work (SOW). You should only identify the minimum requirements of the

government in the RFP. One approach to doing this is to document the minimum tasking required by the government in an example SOW in Section L of the RFP, Proposal Preparation Instructions. Each offeror is then responsible for preparing a complete SOW and submitting it as an attachment to the contract in the source selection. This process provides the offeror the necessary flexibility to define the work for the unique system it will propose while still meeting the government's minimum requirements. The result is a SOW written by the people who will actually perform the work and a greater commitment from the contractor.

While the easiest time to implement this approach is during the development of a new program or contract, implementation on existing efforts is possible and should improve the current operation of the program. Prior to changing the SOW or any other contractual document, the factors that must be considered include the time remaining until termination of the program and the risk associated with changing the existing management processes. On existing contracts, the work should have already been defined in a SOW. Most SOWs, however, have been prepared functionally. To provide the IPTs the necessary tools, you should consider restructuring the SOW, if cost effective, to better align to the product-oriented WBS.

(2) **Developing the program plan. The** next step in the planning process is to describe how the work will be accomplished and how it is tied to the key events defined earlier. A tool ideally suited for this is the Integrated Master Plan. The IMP is intended to become the single management plan that integrates activities throughout the program life, by laying out the core program and process descriptions and critical events. This plan expands beyond the systems engineering process elements of the Systems Engineering Master Schedule (SEMS), as defined in MIL-STD 499B. When a program office uses an IMP it should incorporate the elements of the SEMS. The IMP is an event-driven plan that documents the significant accomplishments necessary to complete the work defined in the SOW and ties the accomplishment to a key program event. Additionally, criteria is provided for each significant accomplishment so that you know how to determine when accomplishment is completed. The IMP is oriented by product using the WBS numbering system and contains no schedule information. On a new acquisition or modification effort, you should direct the contractor to prepare an IMP and submit during source selection as an attachment to the contract. On existing programs, the IMP may be used for future planning and change processes such as Engineering Change Proposals (ECPs) and Contract Change Proposals (CCPs). Depending on the maturity of the program and its associated risk, you may also consider preparing an IMP as part of an overall IPD restructuring effort. An example of the IMP submitted by the contractor in the Brilliant Eyes program is shown in Figure A-6. An example of IMPs for a modification program and repair contract are shown in Figure A-7 and A-X, respectively.

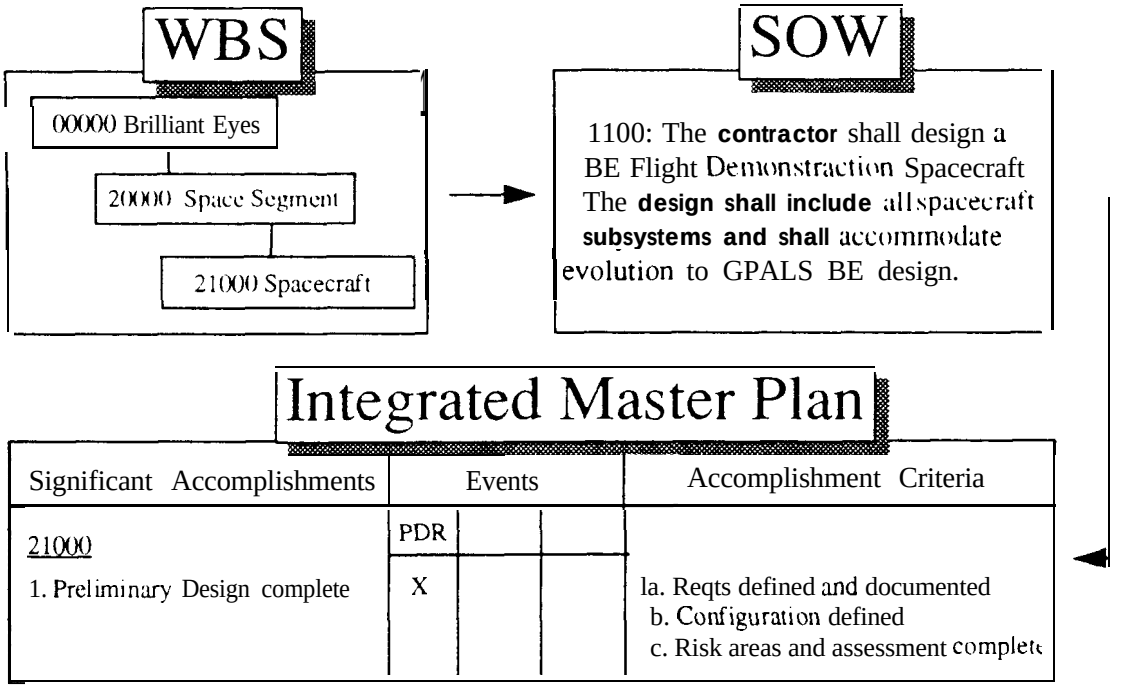

Figure A-6

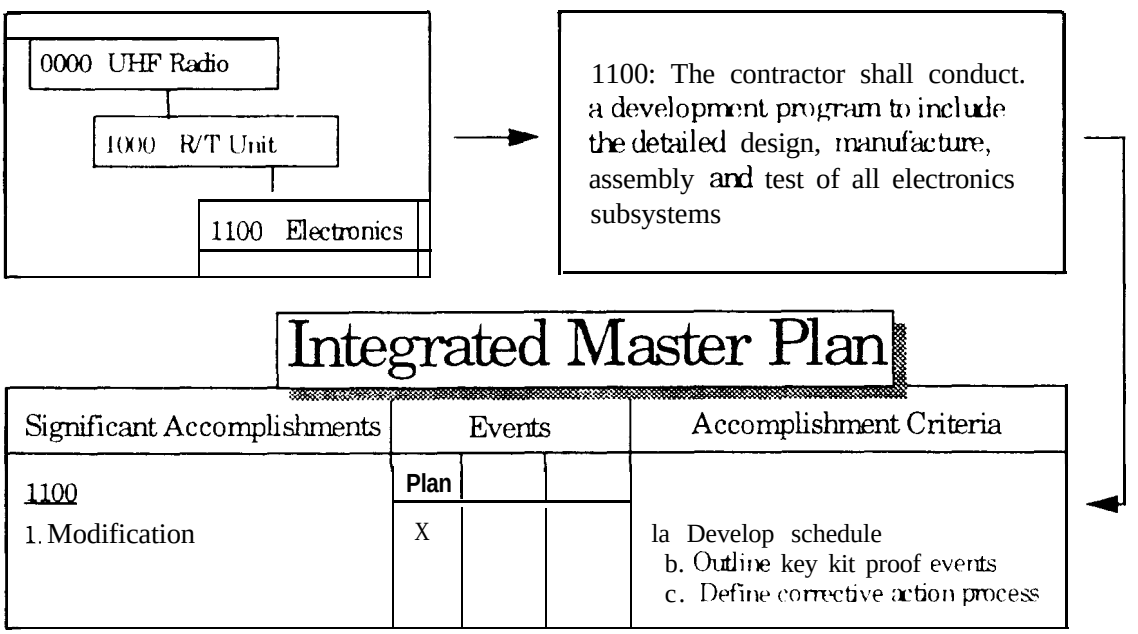

Figure A-7

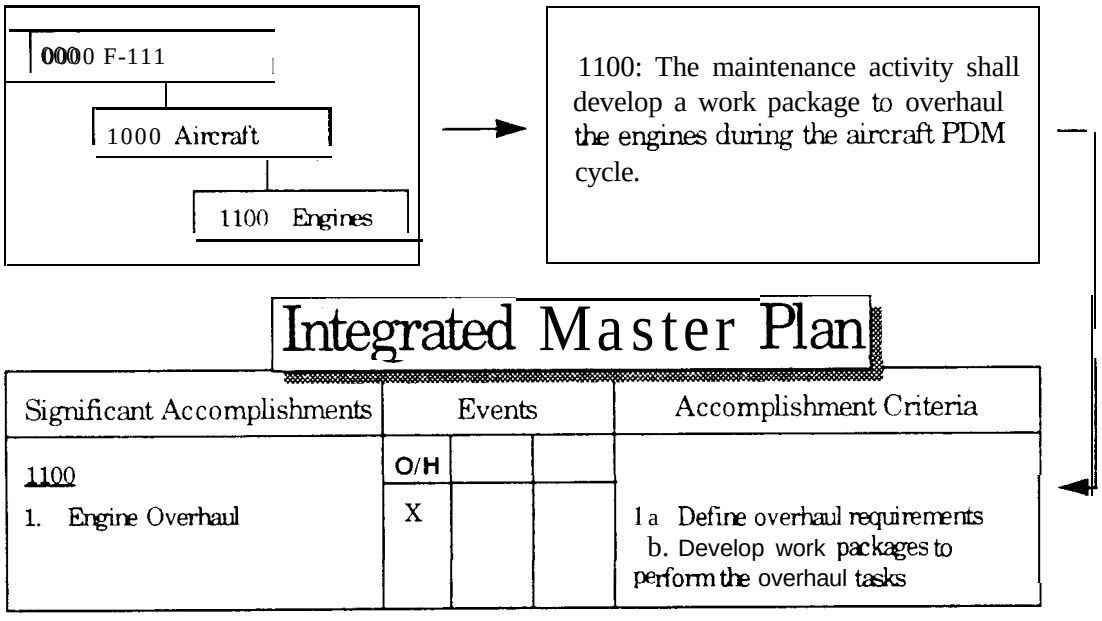

Figure A-8

There are activities, especially management processes, that do not fit well in the above IMP format. For instance, it may be difficult to identify an event or significant accomplishment for configuration management or systems engineering. It is. however, important that these processes are also properly planned. In these cases. prepare a separate section of the IMP that consists of a series of program narratives that describe the overall approach to performing the process and identify any relationships or interactions between the government and contractor. It should also identify any external or internal documents such as military standards used to manage the program and indicate whether or not each document is compliant or for reference only. The narratives are usually limited to 5 pages and are submitted as part of the IMP. For example, a Systems Engineering Management Plan (SEMP) is required by DoDI 5000-2. As defined in MIL-STD-499B, this is intended to be a stand-alone plan delivered by the contractor with the proposal. Those parts of the SEMP which the single manager may want to become part of the contractual documents can be incorporated as part of the IMP narrative.

d. Allocating Resources

After the program is properly planned. the team will have to allocate adequate resources to effectively manage the program and perform the work. This allocation, however, will require changes as the program matures and should be reevaluated on a continuous basis. The key

here is to base the allocation of people, dollars and schedule on the assessed risk of the program. In other words, the higher risk areas of the program should have a greater allocation of resources than the lower risk areas. It is important that the allocation of resources mirrors the team's organization and makes maximum use of the IPD "tool kit".

The allocation of time involves developing a schedule to deliver the product each IPT is responsible for. A tool ideally suited for this is the Integrated Master Schedule (IMS). The IMS is submitted by the contractor as a consolidated Contract Data Requirements List (CDRL) item. Its basic function is to provide a schedule to completing the accomplishments defined in the IMP. It may also serve to provide more detail and insight into the completion of an accomplishment. The IMS is tied directly to the products identified in the WBS using the single numbering system. An example of the IMS used on the Brilliant Eyes program is shown in Figure A-9.

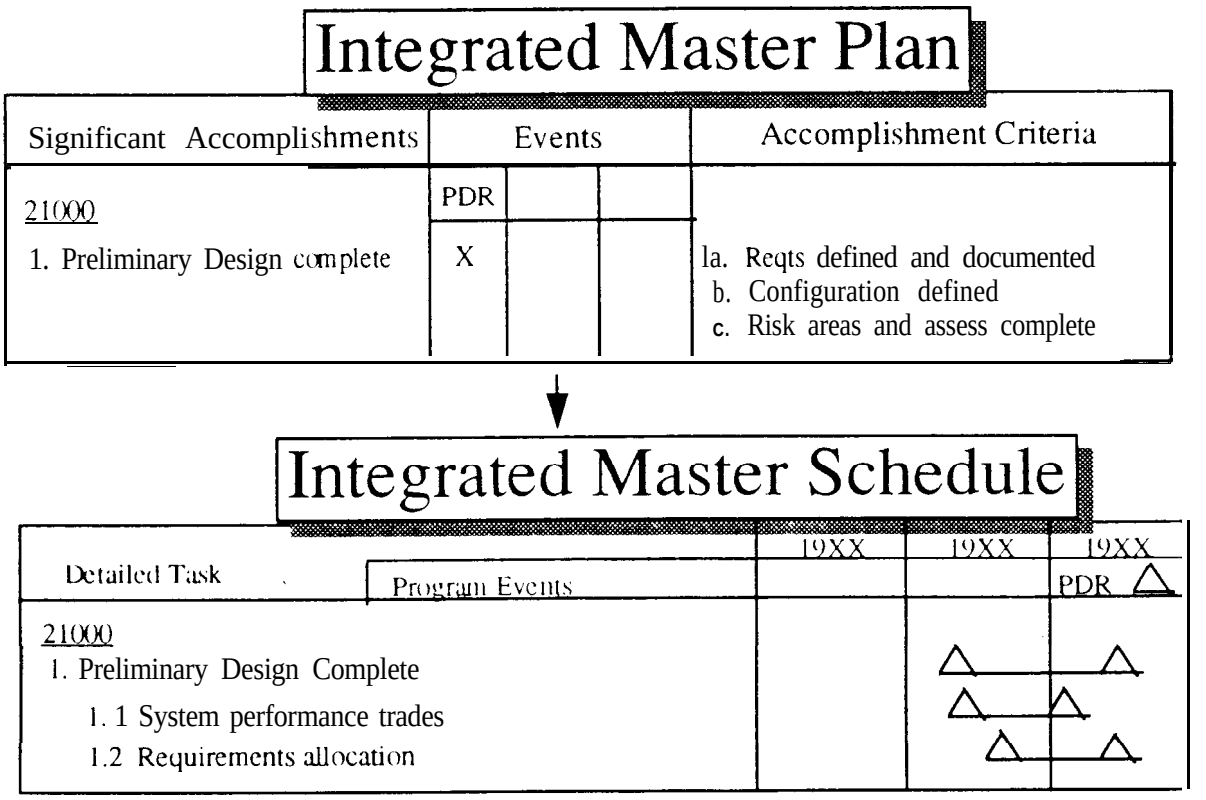

Figure A-9

e. Tracking and Executing

(1) **IPD Tool Kit. The** tracking and executing of the program will undoubtedly be the largest phase of the acquisition. modification or sustainment effort. The key to making this phase easier to manage is effectively using the integrated management framework. This integrated "tool kit" provides the necessary tools to focus on the cost, schedule and performance of the product it is responsible for. Once again, the tools used to manage the program evolve from one phase of the life cycle to the next. The primary cost, schedule, and performance tools used during acquisition and modification are cost performance reports from the contractor's cost/schedule control system. the Integrated Master Schedule, and technical performance measures. The primary management tools used during some sustainment activities include item management data, maintenance data and other performance data in addition to cost reports and work schedules.

For development programs, Technical Performance Measures (TPM) are very valuable. As part of the development process. each IPT **should** develop TPMs to measure the maturity of the product they are responsible for. The TPMs are the true metrics for the success of the program in that they indicate how well the system meets the user's requirements. They also help to provide a balanced system view that will reflect the effectiveness of the data generated using the tools under the single numbering system. In other words, the adequacy of the allocation of resources based on the initial risk assessment will be apparent from the technical maturity of the system evidenced in the TPM data. Since the allocation of resources is an ongoing process, the IPTs and/or senior management can make adjustments based on this information.

The natural next step is to organize in a product-oriented fashion to make maximum use of the framework that exists. At the heart of this organization is the IPT that is given the authority, responsibility and resources to deliver its product to the customer. A more detailed description of the IPT and the organization structure supporting it can be found in Chapter 3. Figures A- 10 and A- 11 provide an example of how the Brilliant Eyes and the F- 111 program implemented this structure.

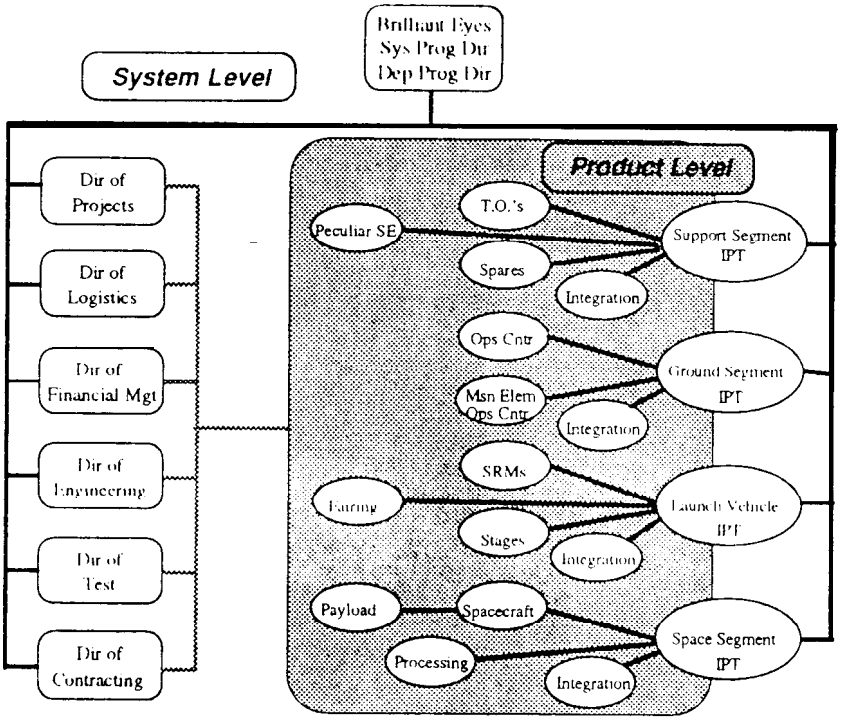

Figure A-10

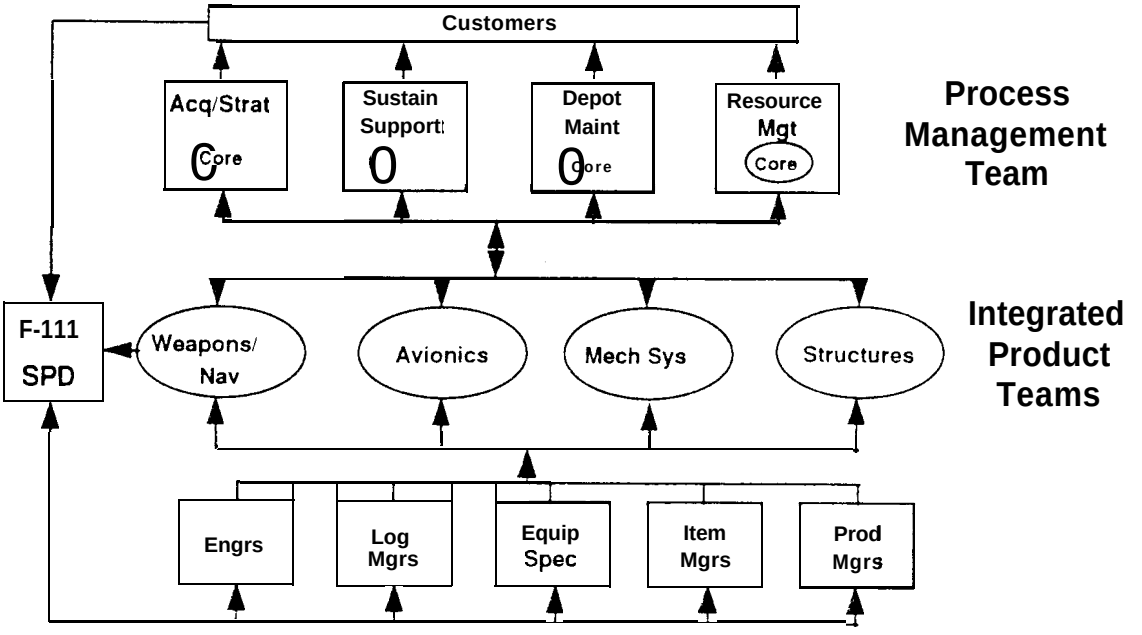

Figure A- 11

Figures A-12 and A-13 illustrate the relationship between the products, people and tools. It is integration of these items applied to the day-to-day management of the program that realizes the maximum benefit from applying the IPD philosophy.

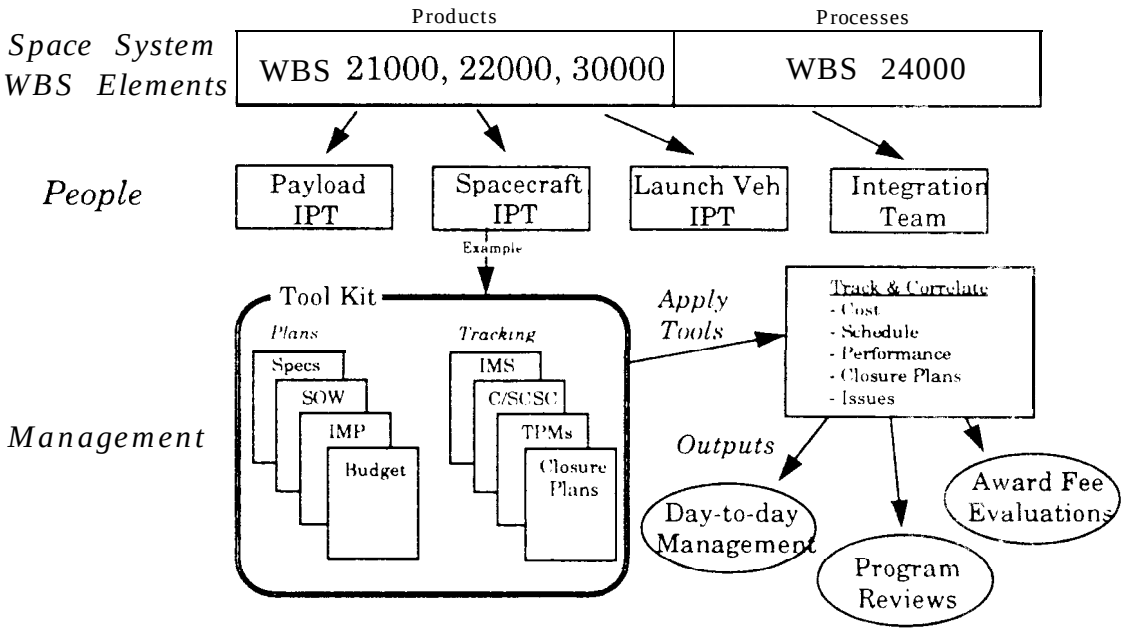

Figure A-12

ATTACHMENT A-2. SUSTAINMENT

1. The integrated process of sustaining a weapon system (including all subsystems) for combat readiness involves defining the requirements for each item of the system. procuring follow -on spares to fulfill those requirements. supplying the items to specific locations. and maintaining the system (both at the weapon system and subsystem level). Each part of this process requires engineering support. The process is depicted in Figure A- 14. This process provides a fully capable, combat ready system. It is fully supported with the right part at the right place at the right time and at the right price. Weapon systems and subsystems need to be ready for combat use at all times. Inherent in this need is defining the requirements (spare parts and equipment needs), developing and supporting the capability to meet the needs, and maintaining an infrastructure to continuously improve the capability. The requirements are driven by reliability and maintainability issues, safety issues, or field assistance requests. Some of the tools used in the sustainment process include data systems to track requirements. maintenance. processes, distribution, and finances. Procurement histories and technical performance information are also critical inputs. Key to IPD in sustainment are the IPTs which are formed from the system program director group, product group, materiel group, and various functionals crossing all phases of the system life cycle. The user/customer (i.e. the using command) is also an integral part of the overall team. The functional areas represented are inventory management specialists, equipment specialists, production managers. financial managers, depot maintenance, engineering, contracting, receiving, warehouse, packaging. shipping, planner, scheduler, mechanic, and quality. Suppliers, such as Defense Logistics Agency and contractors, are also important to the team. This sustainment process in Figure A-14 is further broken down with a model depicting each process step.

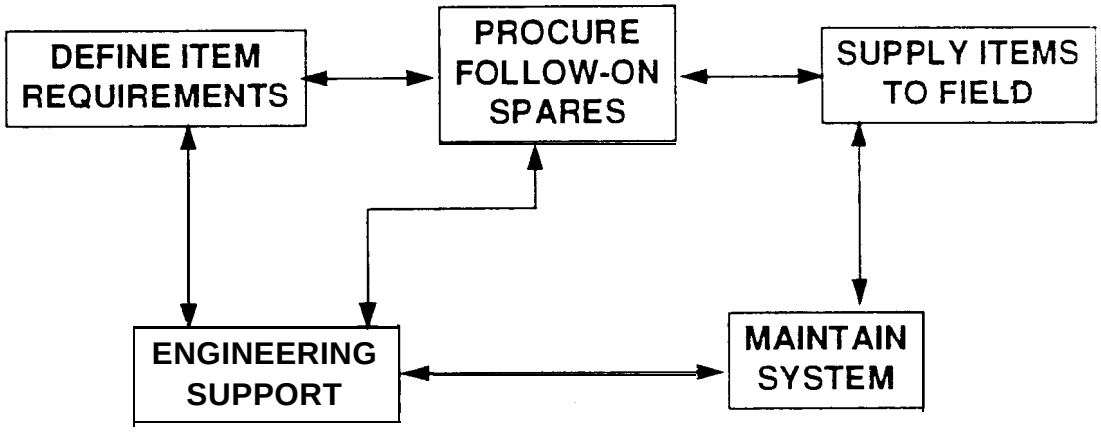

Figure A-14

2. Item Requirements Determination Model

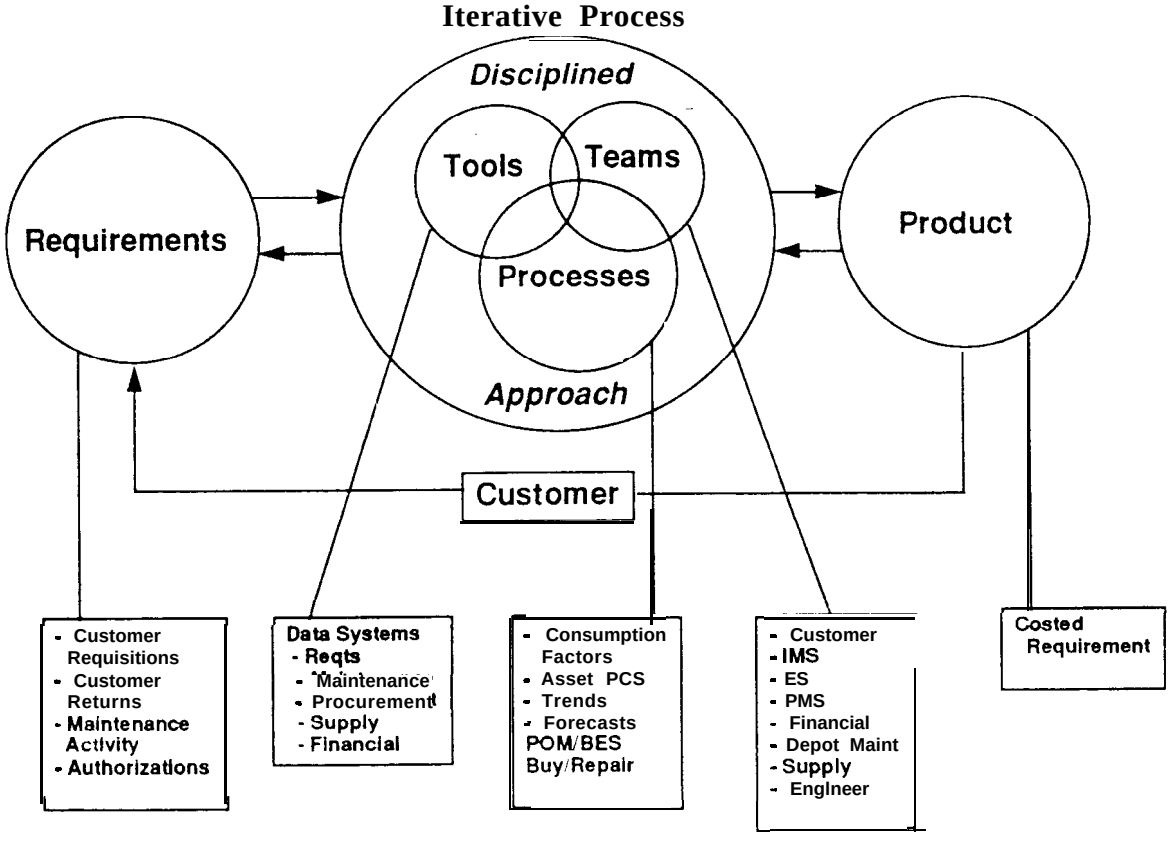

Figure A- 15

a. **Requirements.** Requirements are quantitative expressions applied to Air Force items of supply needed to support peacetime and wartime missions. They are driven by spare parts and equipment needs, which include repair, procurement. termination and disposal of excess inventory. The sources for these requirements can originate from the user or Depot/Contractor maintenance functions. This is a continuous process. Current requisitions are integrated with known and new data in order to provide an end item to meet customer needs.

b. **Tools.** Computation systems such as the Recoverable Consumption Items System (DO41), the Consumable Item Computation System (DO62), the Repair Requirements Computation System (GO72E) and the Equipment Item Requirements Computation System (DO87N/D200C) perform complex "number crunching" to compute buy and/or repair requirements for the needed items. These tools are automated systems which allow the teams

to support a decision to buy or repair the needed item. and track the execution of that decision. These systems are being consolidated and integrated into the Requirements Data Bank (RDB) system to compute item quantities needed to support weapon systems and major end items.

c. **Process.** The mechanized systems are updated to capture the latest customer authorizations. failure trends, asset positions and projected configuration changes that might alter the type and quantity of spares required to satisfy future customer needs. Subsequent to the mechanical accumulation of data, the application of human intelligence is required. This involves review and validation of the computed requirement. Item Managers use various kinds of information from nearly every logistics process to determine the requirements. Information used to determine these requirements include asset balance, locations, user priorities, requisition status, assets due-in, and reserve levels. Projection or computation of requirements is another key process. These projections need data on the item's reliability, who uses it, how often. repair schedules and funding actions.

d. **Teams.** Because the requirements function crosses over many lines the team must have many functional skills. The broad range of skills required to successfully manage item requirements determination is represented by those shown in the team block above. Not only are these skills located at the local logistics center, but support comes from all product and materiel groups as well. Defense Logistics Agency (DLA) and Cataloging and Standardization Center are also involved in supporting these requirements and must be key members on this team. It is through this team effort that weapon system support and sustainability is attained.

e. Product. The product. in this case. is defined as the refined costed requirement.

3. **Item Procurement Model**

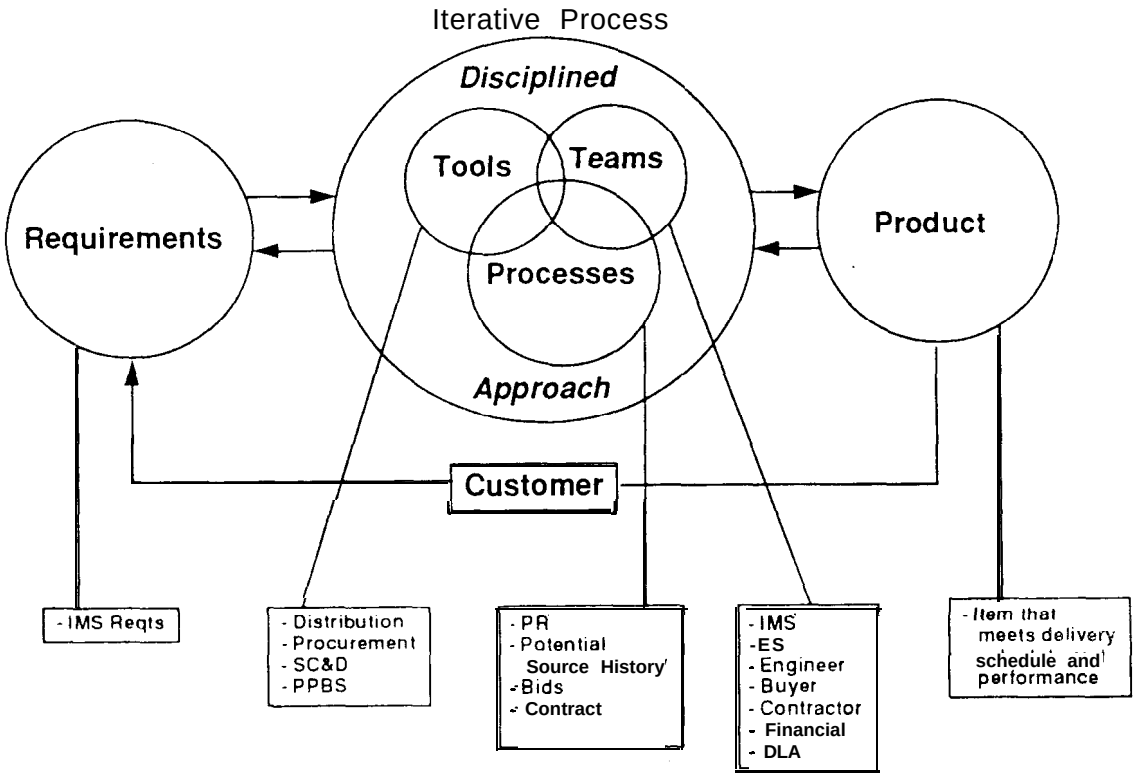

Figure A- 16

a. Requirements. Procurement is the actual mechanism of fulfilling the requirements as addressed earlier. This is the act of awarding a contract and buying the item that was established in the requirement process.

h. **Tools.** Some of the information from the data systems "tools" listed above. will provide for a streamlined provisioning process. Additional data from other systems will be required to fully accomplish this function.

c. **Process.** As purchase requests received for goods or services come into procurement. buyer\ and contracting officers are provided with; procurement history which provides

sources, terms of purchases, price, and delivery schedules, drawings and vendor source files. This information results in individual solicitations for the item. The proposal will be evaluated and negotiation will culminate the agreement.

d. **Teams.** Since the requirements start with the user and flow through the requirement process, all the team members for that process are also key members in this process. The contracting officers and buyers frequently need additional information from the engineers, item management specialist or equipment specialist to complete the buy.

e. **Product.** The final product is generated by the requirement. It is not only important to have the end item in hand, but it is equally important that the product meet the specifications, delivery schedule and cost criteria.

3. Supply Model

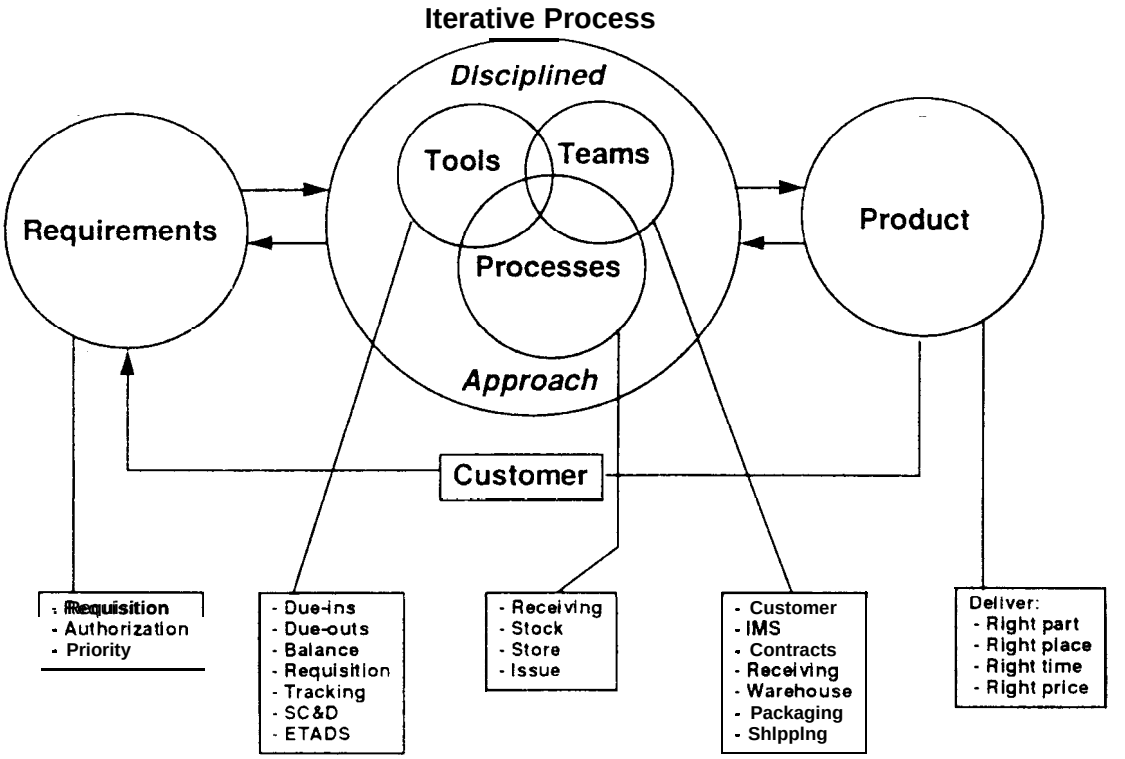

Figure A- 17

a. **Requirement.** The requirement for supply stems from the need to have a part or piece of equipment at a specific location. Supply consists of receiving and storing material, packaging and preserving. inventory and control, shipping, tracking, and coordination of cargo and operating terminals.

b. 'Tools. Several stock, store, issue and delivery systems are being consolidated into the Stock Control and Distribution (SC&D) and Enhanced Transportation Automated Data System (ETADS). These systems will allow on-line data to track material in process, help comply with package and preservation requirements, interface with standard Air Force supply systems, provide real time requisition and status information and improve overall management of custody, allocation and movement information.

c. Processes. Requirements are levied on the item manager by the user which are in-turn passed on to supply. They, in-turn, package the item and ship and track it until it reaches its final destination. This process requires support from many areas to include MGMs, PGMs, SPDs, contractors, and repair depots.

d. **Teams.** The customer, item management specialist, contracting officers and DLA are the key team members in this process. Without all members providing constant communication the parts will not fill the requirements on a timely basis.

e. Product. The end product is providing the right part at the right place at the right time. This is the job of logistics support, which crosses requirements, provisioning, and distribution.

5. Maintenance Model

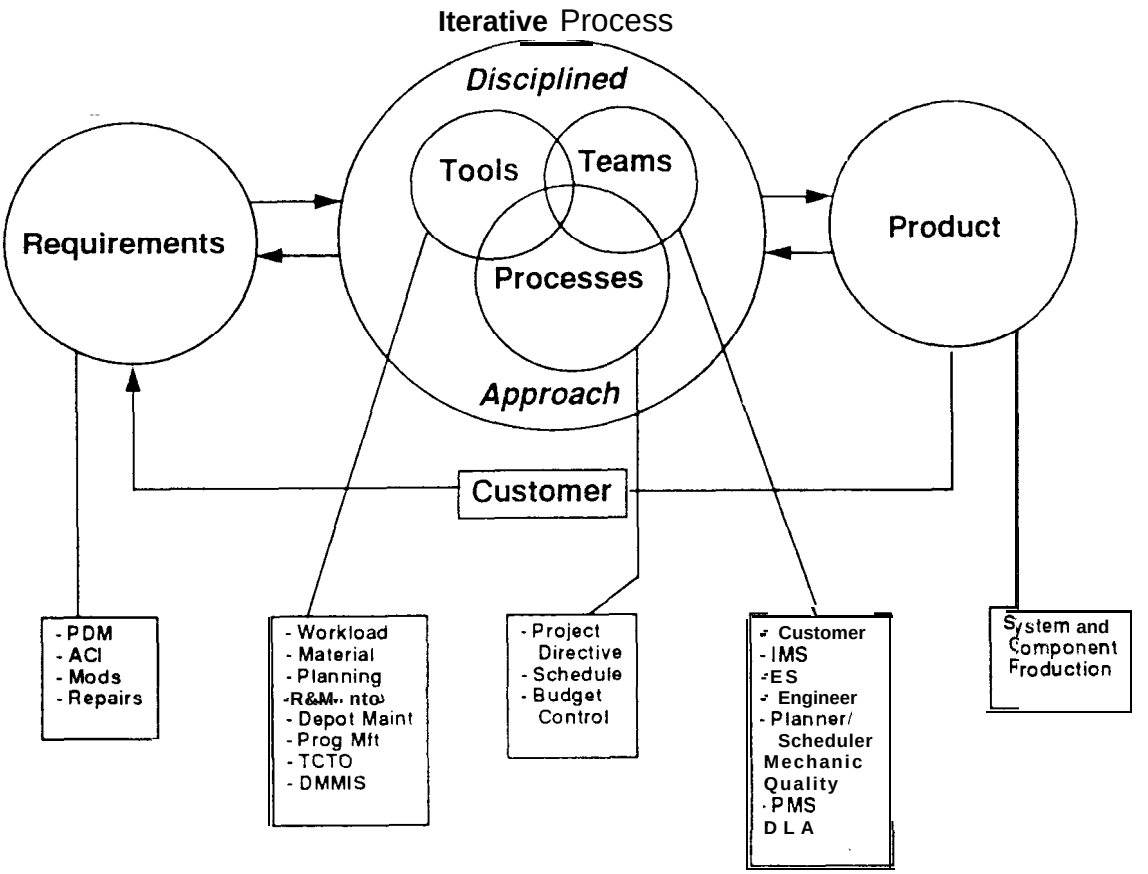

Figure A-18

a. Requirements. The maintenance function can include repair support like hydraulic pump repair, Program Depot Maintenance (PDM) like the F-111 PDM line, speed lines like the F-16 modification install line. or contractor facilities. Requirements are driven by the user. They will either require a part, a piece of support equipment or the end item like an aircraft.

b. Tools. The PDM process uses the Maintenance Requirement Review Board (MRRB), work specs, and engineering drawings as tools to perform their function: The item repair or backshops are integrating their automated systems into the Depot Maintenance Management

Information System (DMMIS) and the speed lines use project directives and Time Compliance Technical Orders (TCTO) to determine their requirements.

c. Process. A requirement is established as a project directive. or repair requirement from the item manager. This generates a work specification for the PDM line, a requirements computation for the repair line or a TCTO for the speed line. The PDM and repair line can also include a modification which will be incorporated into the work specification or requirements computation.

d. Teams. Members in these teams may include the MAJCOM, user, engineering from the SPD, PGM or MGM, equipment specialist, production manager, maintenance planners and scheduler and financial managers along with the mechanic.

e. Product. The final product is a reliable, updated weapon system or component that is returned to the customer.

6. Engineering & Technical Support Model

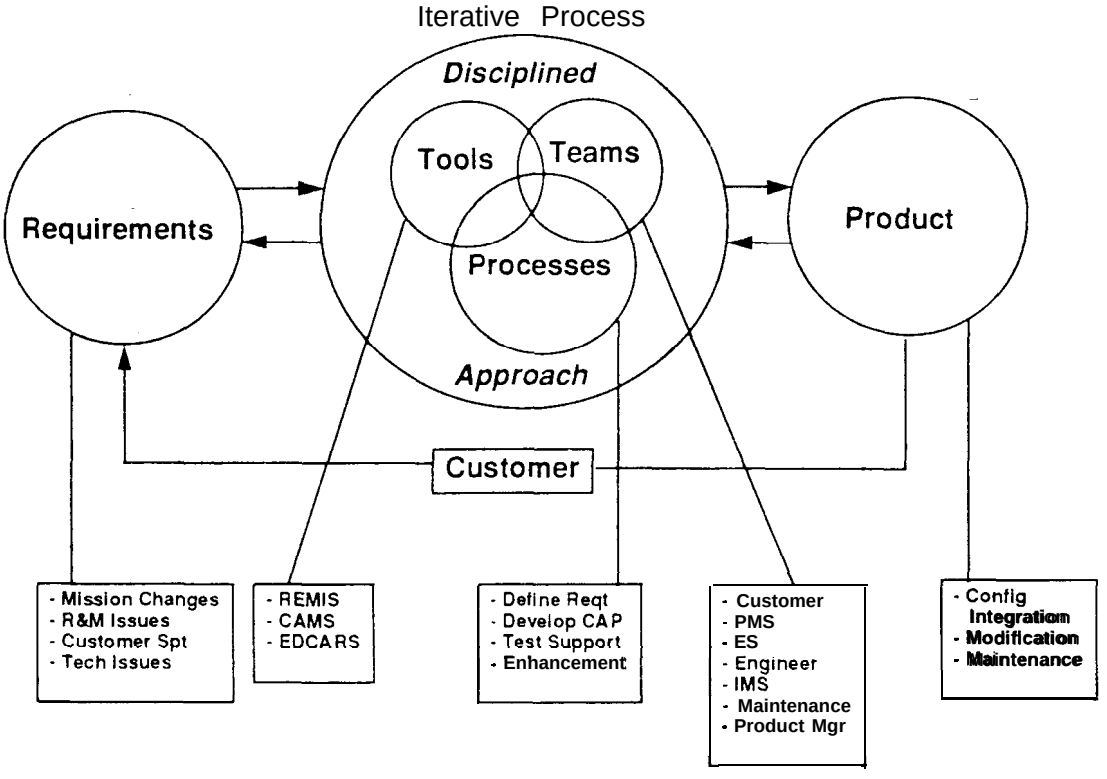

Figure A-19

a. **Requirements. The** engineering and technical support requirements are driven by mission changes. R&M issues. safety issues, security issues, or field assistance request. Their responsibility is to manage the logistics support and configuration control of the structural airframe and the subsystems, (e.g. engines. avionics, electronic warfare support equipment etc.).

b. **Tools.** They must have access to the requirements. maintenance. distribution, REMIS and user CAMS systems. Another tool used by the engineer\ is the Weapon System Master Plan. Engineers use Structural Integrity data, drawings, specifications. technical orders. and failure data to provide engineering expertise and configuration control.

c. **Process.** The engineers need technical performance information for the whole system, be it an entire weapon system, a commodity system or material item. Responsibilities for the system include any information affecting the operation, maintainability and safety of the system such as configuration control, capability status, condition, down-time trends, modifications, improvements, depot maintenance actions, and supply support. The chart below shows some of these functions.

d. **'reams.** The Integrated Product Teams must have expertise in acquisition, logistics, supply support, to maintenance. These expertise **include equipment specialist, item managers, production** management **specialist,** engineers, and program managers.

e. Product. To maintain Combat Readiness and Sustainability of a weapons system.

7. **Feedback.** Feedback is generally provided through the effectiveness indicators (i.e., MICAP Support, Mission Capable Rates, Mean Time Between Failure Rates, Supply Availability Rates, Out of Service Rates) which are recognized in commercial and governmenr supply operations as facilitating effectiveness. These indicators are:

a. Quantity, or the number of outputs produced.

b. Quality, which is to say, the output conforms to their objective user requirements

c. Timeliness, that is to say, the outputs meet scheduled completion dates, and products/services are provided within objective time standards.

d. Customer satisfaction, that is, the measure of output conformance to customer need:. and expectations necessary to provide capabilities to meet mission goals.

SUSTAINMENT EXAMPLE

F-111

An example organizational structure for sustainment IPD is the F-l 11 SPD. (see figure A-20) The F-l 11 is rhe end product. As discussed in Chapter 3. Paragraph 3.b. the F-l 11 office has five functional staff areas (not shown) called Process Management Teams (PMT). The teams are responsible for continuous improvement of the process, keeping abreast of developments outside the organization that may effect their process and act as a cross-functional, system-level team that advise senior management on issues that effect system performance.

F-l 11 IPT ORG STRUCTURE

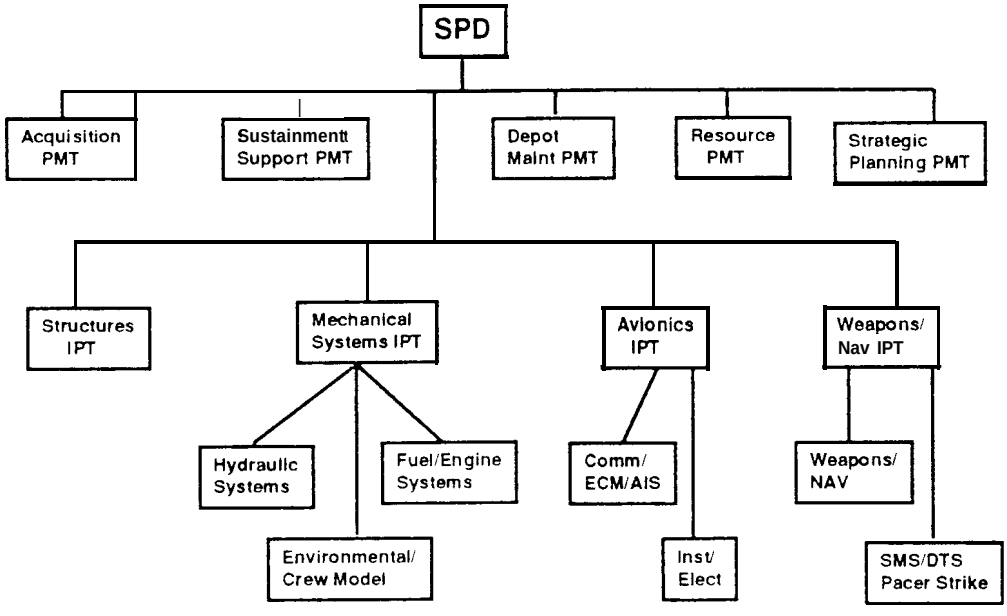

Figure A-20

The core or main emphasis of the organization rests with the four IPTs: structures, weapons. mechanical systems. and avionics. Each tram has a staff permanently assigned to that IPT consisting of equipment specialist, inventory management specialist, production management specialist. and engineers. As resources are needed from other functional areas they are matrixed into the team, i.e. supply. contracting. maintenance. and financial. These teams can

be broken down into sub-IPTs, like the mechanical system has an IPT for Hydraulics, Landing Gear. and Flight Controls and another IPT for Engines. and Fuel systems.

These IPTs are responsible for the total sustainment of their assigned system(s). They form up to the next level of the IPT like the mechanical system and the four IPTs make-up the total F-111 system.

1. **Defining the Requirement. The** requirement is identified by the customer, i.e. user, PGM to MGM, SPD to PGM, Depot Maintenance or Field Unit to SPD, PGM or MGM. This requirement can be for a component, and/or technical or engineering assistance.

2. Translating Customer Requirements. Once the requirement is identified the inventory management specialist (in case of hardware) works with the engineer and equipment specialist to evaluate history, suitable subs, material problems and repair or buy information.

3. Outlining the Program. If a buy is determined, a purchase request is initiated and sent to contracting. The contracting office works with IMS, ES, engineers, contractors and/or depot maintenance to determine source.

4. Planning the Program. A contract is completed and production is started with the item delivered to supply. Supply receives, inventories, and stores the item. The requisition is sent to supply from the IMS for delivery to the user. Supply packages and ships the item out. This process has to be completed with total team work or the wrong asset, quantity, delivery schedule or destination will be encountered.

If a technical or engineering request is received from the customer the process is somewhat different as the request comes into the engineer. They will do a preliminary evaluation of the problem and may need the assistance of the total team, i.e. if the wrong part is being delivered. damage is occurring during shipment or the manufacturer has misread the specifications.

5. **Establish an Integrated Management Framework.** The key to sustainment is team work. No one function can operate in a vacuum, because each task is dependent on toomany areas.

ATTACHMENT A-3. RESEARCH, DEVELOPMENT, TEST & EVALUATION SUPPORT

1. The application of the generic model to a research, development. test, and evaluation (RDT&E) organization is shown in figure A-2 1. This can be applied to laboratory, test, or other such agency. It illustrates that the test and evaluation or technology insertion process is closely tied to product development. In many cases, these processes could be considered a sub-group of the overall product development group.

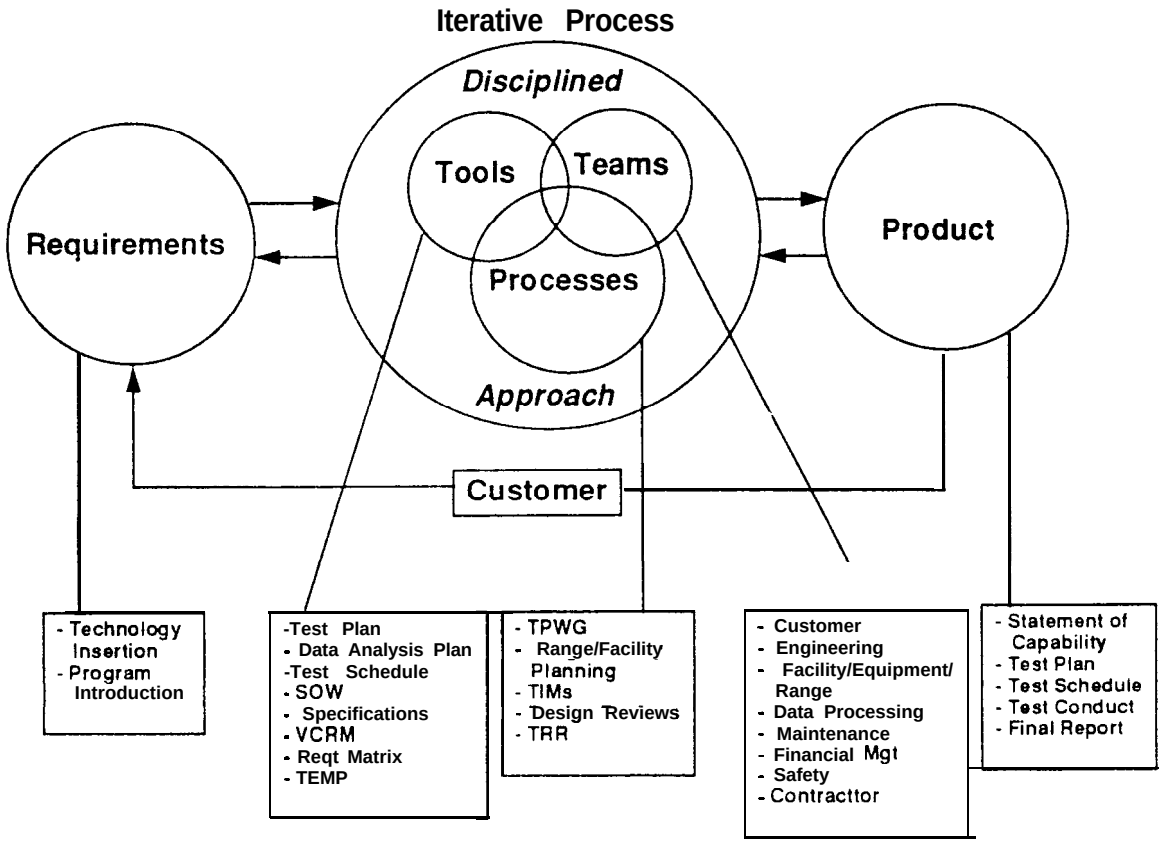

Figure A-2 **1**

a. Requirements. For RDT&E support (test. laboratory, etc.), one or more representatives of the agency should have already been involved with the requesting organization in developing the requirement. The requirement may take the form of a program introduction (test), or request for

technology insertion (lab). The requirement represents a coordinated position between the requester and supplier to validate the requirement.

b. **Teams.** The support agency forms an integrated product team of all concerned functions, including the requesting agency and suppliers. For example, a team would involve the project/test engineer, functional engineers. facility/equipment operators, data processing, maintenance, financial management, safety, program office, and contractor.

c. **Tools. The** integrated team creates a tool kit of documents for planning and tracking the development of the product or process. For example, a team would develop and/or use statement of work, test and evaluation master plan, test procedures, data analysis plan, test schedule (including resource availability), verification cross reference index, system segment specification, prime item development specification, and requirements matrix.

d. **Processes. The** program is executed and monitored through various processes such as test planning working group, scheduling, technical interchange meetings, test readiness reviews, design reviews, etc.

e. Product. This integration of tools, processes, and people should produce a product which meets the customer's needs in the most cost effective and efficient manner. For example, a test team would initially provide a statement of capability followed by a test plan and schedule, execute the test, and provide a final report.

f. Feedback. Feedback on how the test and evaluation or technology insertion process is proceeding is as essential for RDT&E Support as it is for product development. The team needs to know how their process plan is progressing so appropriate adjustments can be made. Test programs may track test points completed or objectives accomplished against a pre-determined goal (typically driven by when the customer needs the data). The test organization may also want to track these measures along with constraints such as asset availability or system test readiness in order to work more effectively with customers and suppliers. Appropriate feedback for a technology insertion project will depend on the particular product being delivered. However, it will be very similar to that required for product development (i.e. cost, schedule, performance, supportability, in order to meet the requirements of the product involved.

RDT&E SUPPORT EXAMPLE

F-16 COMBINED TEST FORCE

The combined test force (CTF) concept used at the Air Force Flight Test Center (AFFTC) is an excellent example of integrated product development. In the case of the F- 16 CTF, the product is the flight test evaluation of the F- 16 weapon system. This stems from requirements typically generated by the F-16 System Program Office (SPO) based on user requirements. The F-16 prime contractor also influences the flight test requirements as well as the operational test and evaluation (OT&E) agency (AFOTEC and/or ACC/AMC organization). The teams are formed with personnel from AFFTC, primarily responsible for the flight testing, as well as the contractor and in many cases the OT&E agency (see figure A- 14). The F-16 SPO and ACC are also an integral part of the team through test planning working group (TPWG) meetings, test management council (TMC) meetings. and daily contact. Tools used include regular telecons on flight test activity and issues. aircraft utilization schedules, and test project priorities. These are used regularly by the entire team to conduct the processes of test technical and safety planning. scheduling (ranges, aircraft, facilities. assets), analysis. conduct. and reporting.

1. **Understanding the Requirement.** Having the right people actually located at the CTF is a key element in understanding the requirement. The F- 16 CTF is a combination of AFFTC personnel. contractors, and OT&E personnel. AFFTC. through the 4 16 Test Squadron (TS), derives its requirement from the F- 16 SPO which sends a program introduction. However, the requirement for flight testing must also consider requirements in AFR 80- 14 and the user requirement for an effective weapon system. The 416TS, in partnership with the F- 16 SPO and other members of CTF. ensures that all requirements are met.

a. The OT&E agency provides a user view of the test requirements and also represents their own interests since they will be conducting operational testing following development testing conducted by the CTF. The OT&E agency is either directly represented at the CTF with personnel actually located there and participating in thr testing, or the 4 16TS maintains close contact with them.

b. The contractors. both prime and subsystem. provide technical expertise on the systems to ensure an effective test.

2. Outlining the Approach. The program introduction provided by the SPO forms the basis for the test approach. It outlines the individual test projects necessary for the program. The approach is discussed with all members of the CTF, the SPO. and the user at TMC meetings. An agreed to approach is determined based on the program introduction, AF requirements. direction to the contractor. asset availability. and user needs. To formalize this approach, the 3 16TS provides a statement of capability (SC) to the F- I 6 SPO. The SC represents the integrated estimates of each of the project teams depicted in figure A-32. The estimates are based on the inputs from several experts

resident at the CTF on the project teams: flight test engineers, test pilots, prime contractor engineers and pilots, subsystem engineers. The various SPOs involved in the total system also have an input to the SC.

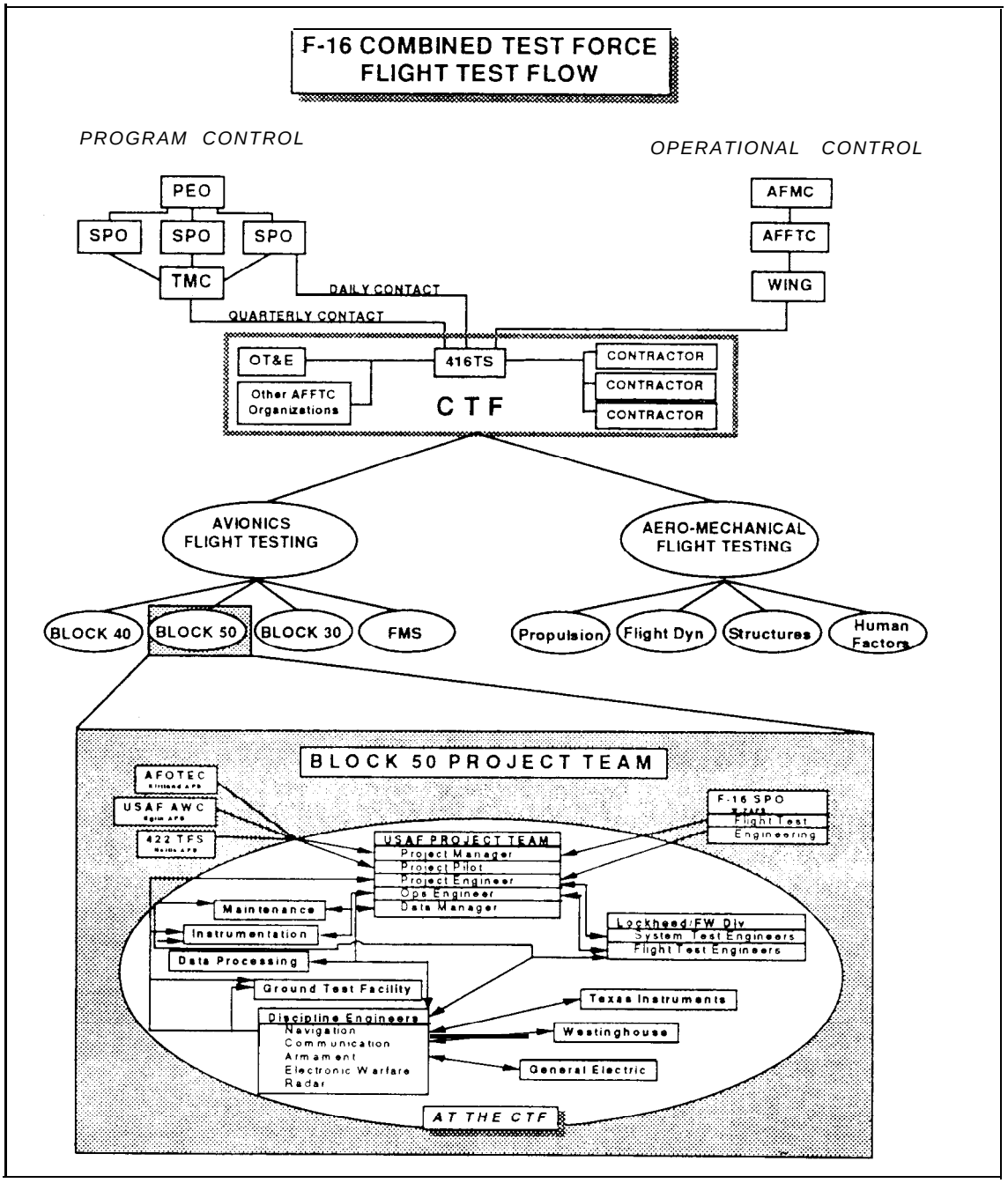

Figure A-22

3. Planning the Activities. The TPWG with the SPO and the CTF forms the plan for accomplishing the approach outlined by the TMC and SC. TPWGs are held for various groups of projects required by the test program (e.g. airframe, flight dynamics, avionics, etc.). The Block SO Avionics team. depicted in the expanded portion of figure A-22. holds quarterly TPWG meetings. These meetings discuss the test objectives, status, plans, methods, results, and issues. Having the entire team together in this manner enabled quick resolution to the issue of handling Avionics System Segment - Specification Verification testing, a new requirement levied half-way through the program. The TMC integrated schedule coalesce these TPWG plans into a master plan covering all test programs.

4. **Establishing Event Driven Plan with Success Criteria.** Technical and safety planning is conducted by the CTF which develops a test plan and procedures. The technical plan includes requirements stated in the F- 16 Test and Evaluation Master Plan, the System Operational Requirements Document, and from the contractor. The plan contains objectives that must be met to accomplish the project and describes procedures that must be conducted to fulfill the objectives. The plan is reviewed at AFFTC to ensure it meets all technical and safety requirements. The 416TS is primarily responsible for this but the contractors have much input to the technical part of the plan. Final approval of the plan is with the F- 16 SPO.

5. Scheduling Events. A schedule to accomplish the test procedures is laid out by the CTF. This considers the asset availability, relative priority of the projects (as established by the TMC), and outside influences to the schedule. The project Operations Engineer (see figure A-22) develops a 3-week schedule for all project aircraft following priorities established jointly by the test team. This schedule is discussed weekly by telecon with the applicable contractors and SPOs. Once support requirements are determined by the flight test engineer, the schedule is submitted to a central scheduling board at the CTF.

6. Allocating Resources. Both the CTF (416TS, contractors, OT&E agency) and the SPO work to allocate the appropriate resources to the individual projects. With many projects going on within the test program, allocation of resources is a dynamic process. The 416TS determines personnel (test pilots. test engineers) to work the project and also draws on other AFFTC agencies (range. data. ground test, etc.) and schedules resources to accomplish the project. The contractor provides personnel with appropriate technical expertise as tests are being conducted as required, and the OT&E agency monitors the testing as it is on-going. The CTF works closely with the SPO to ensure that funding is maintained to accomplish the testing and that test assets (hardware or software being tested) are made available to the project in a timely manner.

ATTACHMENT A-4. STAFF ORGANIZATION

1. The Model in Figure A-23 applies to a "staff type" organization, which includes HQ AFMC and staff organizations at each center. The staff includes not only the commander's, but also each functional staff. Some examples of products from these organizations are policy, regulations, functional training, and issue resolution.

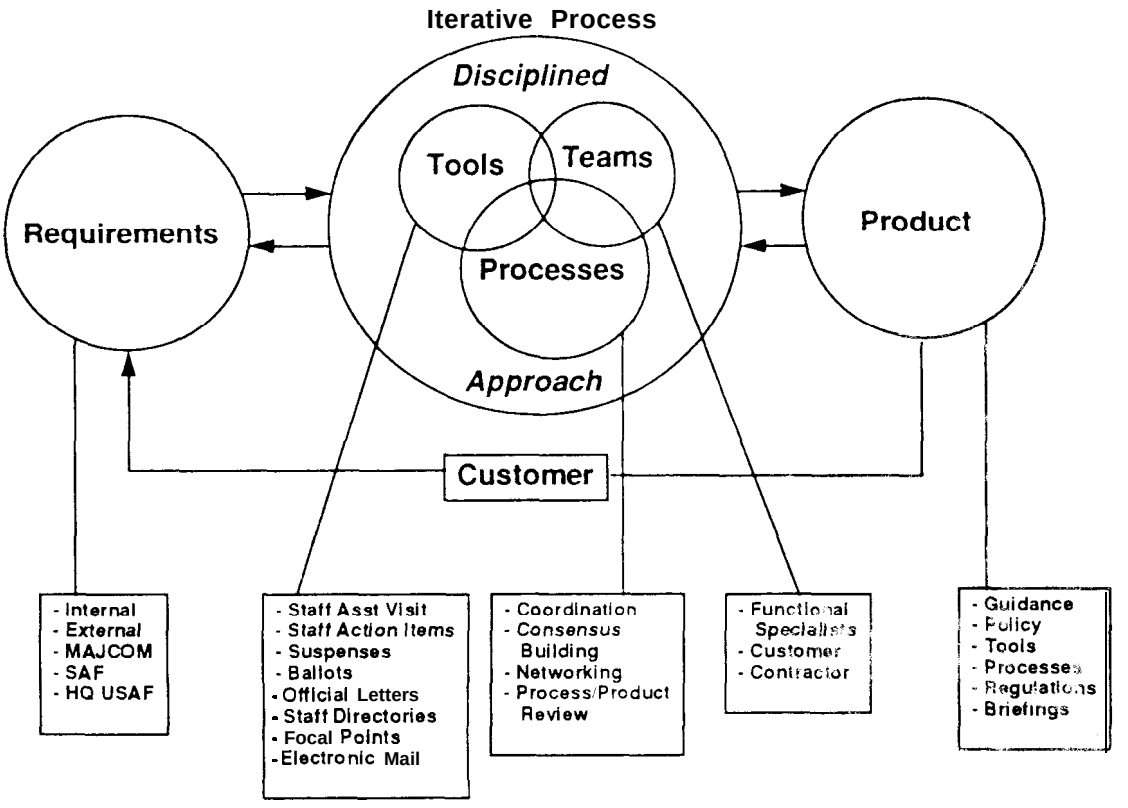

Figure A-23

a. **Requirements.** The staff works to organize. train and equip in direct support of the organization mission/goal/objective in insuring customer requirements are met. The staff also acts as a clearinghouse for data. Staff requirements are generated from any number of internal and external sources all in support of the organizational mission. As an example, the AFMC headquarters staff acts on requirements received from higher level staff agencies. other major commands. its own center commanders and internal functional directorates.

b. **Tools.** A number of tools exist for use by the staff/action officer in accomplishing the given task. The tools are situation dependent and vary in scope to provide anything from an informal response to a full staffed policy package. Examples of tools used to support the staff mission are staff assistance visits, staff action items, memos, formal letters, suspenses, ballots. staff directories, focal point listings, electronic mail and data systems. Within AFMC the Command Management Framework with its mission element stovepipes, boards and focal points is a formal staff tool established to directly address the specific mission needs of' the customer.

c. Processes. The product of good staff work is the best course of action representing the views of all impacted sources. The coordinated product tells the decision maker that the people coordinated agree with the position taken and will support the course of action within their areas of responsibilities. Key aspects of the staffing process are coordination, networking and consensus building.

d. **Teams.** Good staff work requires functional "teaming" to examine a requirement or attack an issue from a broad perspective. Teaming mandates "Open" communication and the right functional knowledge and skill correctly applied in developing the optimal solution. Key to staff teaming is understanding the task at hand and communicating functional impacts in achieving consensus towards a solution.

e. **Product.** Staffwork will most often result in some sort of "informational data product" (Data response, Guidance, Policy, Tools, Processes, Regulations) provided for use by a decision maker, the customer. It is essential that the product addresses the needs of the customer and responds to the defined requirement.

f. Feedback. Immediate feedback to a staff response is often provided during the coordination cycle where a "non concur" or "comment" usually requires resolution prior to continuation. The staff should consider all decisions or options developed in light of the customer requirement. One method of follow-up feedback is the customer satisfaction survey.

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4. Stakeholder Participation. Involvement in the decision making process by those who have a vested interest in the success of **the** outcome.

5. **Empowerment.** The Mission Element Boards (MEBs) are responsible for the "voice of the customer" and act as primary decision maker for the mission element. The MEB consists of USAF, SAF, Headquarters Staff and Field commanders. The MEB provides input to the corporate board on all aspects of its mission element (programming, planning, budgeting, etc.). The board is the primary requirements driver for prioritized input to the corporate board.

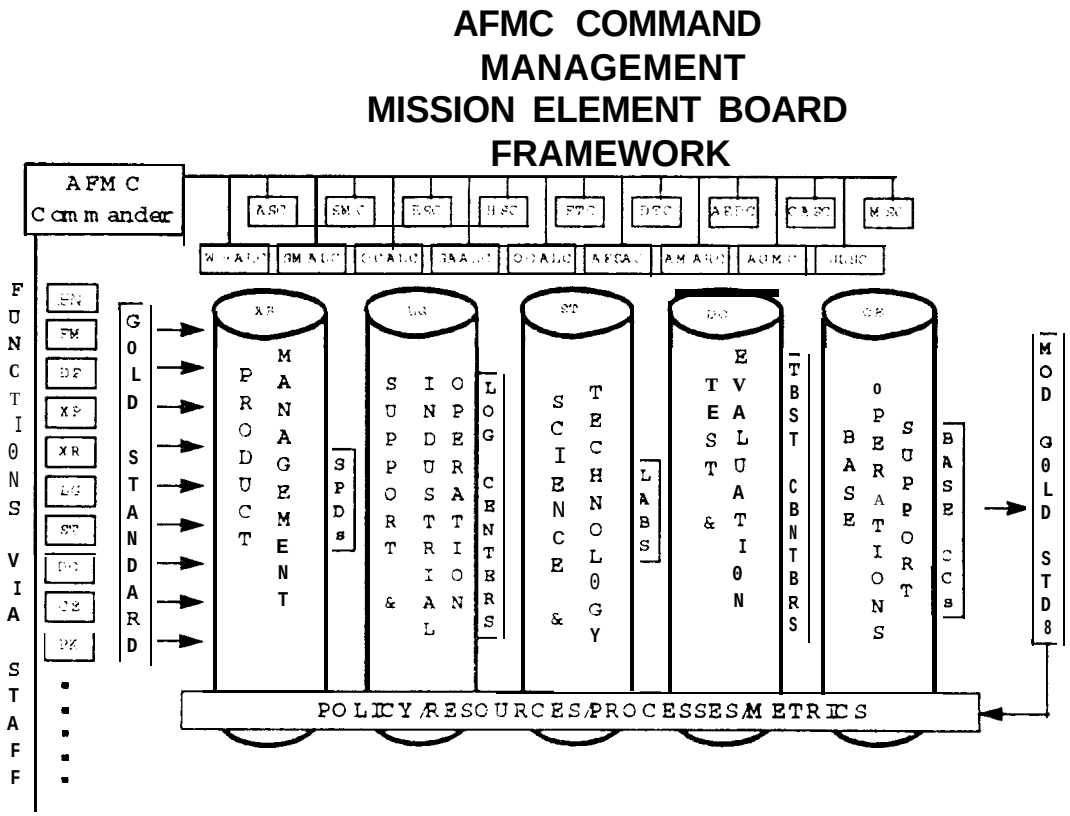

Figure A-24

ATTACHMENT A-5. SERVICE ORGANIZATION

1. The Model in Figure A-25 applies to the variety of services performed throughout AFMC. Many of the services are part of the Base Operating Support Mission Element Board. Some examples of services are the Hospital, Civil Engineering, Morale/Welfare/Recreation, Security Police, and Reprographics.

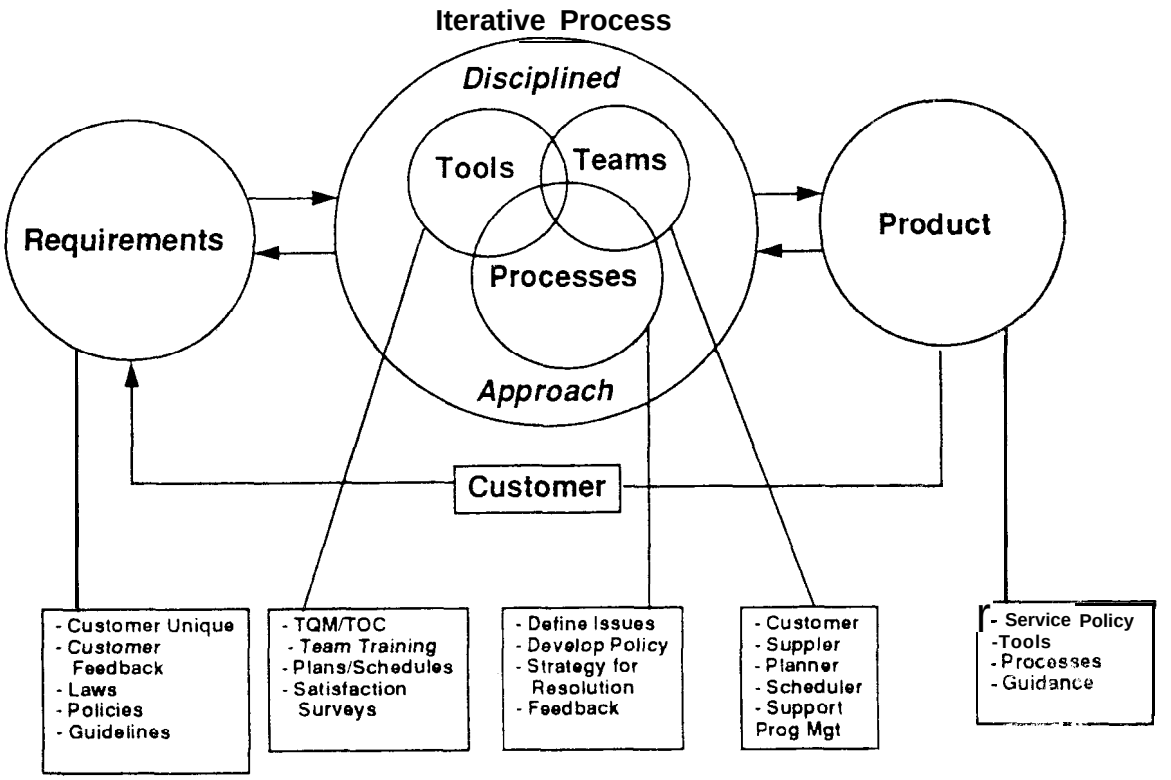

Figure A-25

a. **Requirements.** Requirements are defined by customer wants, needs and desires. Customer requirements can be specialized/customized and are often regulated by laws, policies and guidelines. The key to successful service is the development of reasonable and achievable requirements. Generally the customer wants quality service. when needed. at an affordable cost.

b. Tools. Tools are applied in both defining the requirement and translating the customer

need into a product. Integrating the tools with the applicable process is key. Tools are process and product dependent and include data storage and processing systems, communication systems, integrated plans and schedules, applicable policies/regulations/guidelines.

c. **'reams.** Teaming is a requirement to providing a broad response to the needs of the customer. Effective teaming requires involving all impacted specialties to include the customer and supplier. Communication is the key. The team is responsible for integrating technology with business strategy.

d. **Processes.** The requirement is met by integrating tools, processes and resources in achieving the ultimate goal of customer satisfaction.

e. Product. The successful integration of tools, processes and resources will yield the right product (service), provided at the right time, for the right price. The ultimate product is a satisfied customer.

f. **Feedback.** Continuous feedback is required for achieving continual customer satisfaction. Metrics addressing cost. schedule and performance should be established and tracked. Examples include Customer Satisfaction Survey, Peer and Industry Recognition, Profitability. Performance against a standard, and Repeat Business.

SERVICE ORGANIZATION EXAMPLE

1. One example of a Service Organization implementing IPD is the USAF Hospital at Robin\ AFB. The following text is taken from a paper written by Richard A. Yates, Quality Team Director at the 653d Medical Group, Robins AFB GA. The paper is titled "Establishing a TQM Culture within a Military Medical Environment" but the concepts also apply to IPD. The challenge faced by the hospital was how do you develop and implement a system which provides for the utilization of TQM within a military medical environment? Some of the things involved were empowerment, process analysis. training, and teaming.

a. Empowerment: Good management techniques within the military have always taught that a leader should optimize the talents of their subordinates. With this in mind, the hospital approached the perceived conflict between rank and empowerment through the idea that the leaders provide direction and guidance while allowing their staff to provide the input for accomplishing the mission. The professional staff did not have to give up decision-making authority but were no longer required to make it for the entire process. Another aspect was the goals of the organization were being formed by management and the roadmap of how to get there by the workers (teams). This reinforced the concept of a team and developed both trust and respect for all members.

b. **Process Analysis:** The hospital attempted to overcome the negative image of quality through the concept of examining the process, not the individuals. They began by developing an understanding of system approach as it relates to a process, from input through the processor to the output to include both control and feedback. As the staff became comfortable with this concept, they began to grasp the relationship needed to move into utilization of teams to look at improving a process. The realization that teams could cross traditional boundaries and look at an entire process, which may not be broken, to seek continuous improvement was not instilled overnight. A cross directorate group was established to provide an implementation plan for the facility. Key to this was training.

c. **Training:** The question of how to structure the learning experience had often been to train the senior personnel first and then cascade it down through middle management eventually reaching down to the workers. In evaluating this approach, they determined that this frequently led to mistrust. To eliminate this potential misconception, it was decided that the training would be done in teams.

d. **'Teams:** With an active training program and process analysis came teams. An example of implementation is a team of folks within the OB Ward who made recommendations for a single labor and delivery room thereby eliminating the need to move the mother midway through labor. They did all the necessary research to include determining the customer's desires. Not only was the process approved. but the team was selected as the

first recipient of the Quality Team of the Quarter Award. Another example is the Dental Clinic putting together a team consisting of the dental clinic, family practice clinic, internal medicine and aerospace medicine to analyze the Medical Consult Process for Dental Services The team charted the process and determined the primary constraints using TOC training. After implementation of their recommendations, they saw an increase in patients seen of 221%. As this concept took hold, it became apparent that the reward systems in place did not fully recognize team work and initiative. They often praised individuals at the expense of the team. The Quality Council set out to develop an award system which recognized the team effort.

2. The hospital will continue to pursue the concept of continuous improvement. They will use tools such as the President's Award and the Baldrige Award as tools for benchmarking so as to ensure they continue to strive for improvement. They will find other medical facilities, both military and civilian to compare themselves to in order to measure success. As new tools are developed they will expand their training programs to include them.

ATTACHMENT A-6. FOREIGN MILITARY SALES

1. The Model in Figure A-26 applies to a Foreign Military Sales weapon system acquisition. The documents identified in this model are some of the tools and processes used in establishing and executing these types of sales. Additionally, once an FMS customer has a USAF weapon system in their inventory, there are other tools and processes to implement and execute the sustainment of those systems. For further information on FMS, recommend you review the IWSM Guide, AFMCP 800-60 and AFR 130-1.

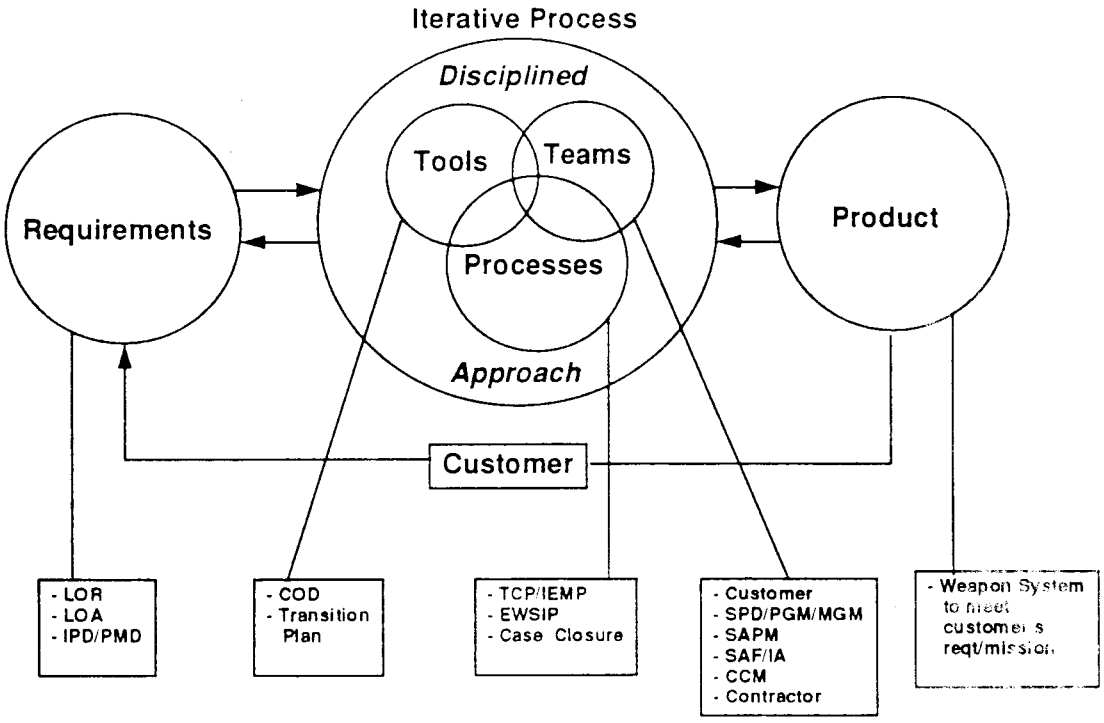

Figure A-26

a. **Requirements.** The FMS customer submits his requirement through a Letter of Request (LOR), which is usually a brief description of his requirement for an existing USAF system, including a total support package. If USAF's Letter of Offer and Acceptance (LOA), which is the government-to-government contract detailing the program requirements, is accepted by the FMS customer, then an International Program Directive is issued by SAF/IA.

b. **Tools.** Potential FMS system acquisition programs can be identified in Cooperative Opportunities Documents (COD). Additionally, weapon systems which are candidates for retirement from the USAF inventory are identified for potential FMS sale in the International Programming Document and prepared for in the FMS Transition Plan. Once the LOA is signed and accepted, the FMS program would be tracked through to case closure by a Command Case Directive (CCD) which provides executable funding, detailed execution instructions and requires a milestone chart be created by the IPT to track the program schedule.

c. **Teams.** FMS system acquisitions are managed by an IPT like USAF programs; however, for FMS the team leader is the Security Assistance Program Manager (SAPM), who represents the SPD. The IPT also includes SAF/IA Country Director, AFSAC Command Country Manager (CCM) along with the FMS customer and the contractor(s).

d. **Processes.** Although FMS system acquisitions are processed in a similar fashion to USAF systems, there are some unique aspects which the FMS customer case use, such as the Technical Coordination Program (TCP), International Engine Management Program (IEMP) and the Electronic Warfare System Implementation Program (EWSIP). Additionally, FMS case closure procedures are unique to allow FMS customers more flexibility with their funds.

e. **Product.** The product provided to the FMS customer may be a modified USAF system which has been adapted to meet needs relative to a special mission or environment. The "product" will usually include a total support package, and, may include requirements which are not related to the weapon system involved, but are included in the LOA as a service to the FMS customer.

f. **Feedback.** Continuous feedback should be achieved from the FMS customer relative to their mission requirements being met. Metrics on cost, schedule, performance and sustainability will provide the data to determine customer satisfaction, and identify areas for improvement.

FOREIGN MILITARY SALES EXAMPLE
SYSTEMS ACQUISITION FOR SECURITY ASSISTANCE

Security Assistance procedures overlay the existing USAF process for the most part; however, because of laws such as the Arms Export Control Act, the sale of materiel and services to FMS customers requires additional, special handling. The policy for Security Assistance is explained in the current AFR 130-1 (soon to be AFI 16-101). The majority of FMS sales are for weapon systems already fielded and operated by USAF. There are many systems operated by FMS customers which are no longer used within the USAF; however, the US Government is obligated to provide support to the FMS customer for the life of the system. This promise has re-defined "grave" in the IWSM tenet of "cradle-to-grave" support. The USAF takes Security Assistance into consideration when planning new weapon systems by submitting Cooperative Opportunities Documents at each milestone of development. Additionally, as the USAF considers phasing out a weapon system, the Security Assistance world plans for possible transition into foreign governments or organizations through the International Programming Document.

1. **Understanding the Requirement.** The FMS customer advises USAF of the requirement by submitting a Letter of Request (LOR) to SAF/IA. This document is an initial request identifying the need. An IPT is formed from functional organizations responsible for the various requirements needed to meet the FMS customer's mission. To ensure the customer is offered a comprehensive package, a site survey may be conducted to fully understand the requirement. Once the data is completed, a LOA is developed and presented to the customer which lays out the customer's requirement in more detail. This LOA is the government-to-government contract between the USG and the FMS customer. Should the FMS customer accept the LOA's terms and conditions as laid out, it is then implemented to the appropriate USAF field organization through the PEO/DAC with either an International Program Directive from SAF/IA or a Program Management Directive (PMD) from SAF/AQ.

2. **Outline the Approach.** Upon receipt of the IPD/PMD, the Security Assistance Program Manager (SAPM) (appointed by the SPD) and the Command Country Manager (CCM) develop a Command Case Directive (CCD). This document serves as a detailed document to task the various organizations within AFMC and other commands to execute and provide the requirements of the LOA. As with USAF programs, the Integrated Acquisition Strategy Plan may be developed to review the FMS system acquisition, depending on its magnitude, complexity and financial impact.

3. **Plan the Activities.** In conjunction with the development of the CCD, the SAPM must develop a FMS Management Plan. This plan resembles an integrated master plan and schedule or an Acquisition Program Baseline. The FMS Management Plan includes a milestone chart, program management plan, an integrated logistics support plan and a training plan.

The LOA lines are established in the Case Management Control System (CMCS) and the Security Assistance Management Information System (SAMIS) for financial and logistic tracking. The CCM at AFSAC also begins to ensure documentation is maintained for eventual case closure, once all materiel and services are delivered and completed. The continued support of the weapon system after delivery is planned for by offering the customer membership in follow-on support programs such as the Technical Coordination Program (TCP), International Engine Management Program (IEMP), and the Cooperative Logistics Supply Support Arrangement (CLSSA).

4. **Allocating Resources.** Security Assistance workload is funded through either FMS Administrative surcharge funds or direct case funds. Both allocations must be documented: the FMS Admin allocation is supported with a requirements package through the FM community; whereas, direct case funds are used to support a system acquisition and identified with an Initial Manpower Determination (IMD), followed by a requirements package (602). HQ AFMC/IA has initiated action to obtain FMS Admin funds to support pre-LOA activity, such as the customer's requirements definition, site survey, LOA development.

ATTACHMENT A-7. DAILY ACTIVITY

1. The idea behind the model in Figure A-27 is that IPD can and should be applied to everything you do, including your everyday activity. IPD isn't just for the big products and the significant issues.

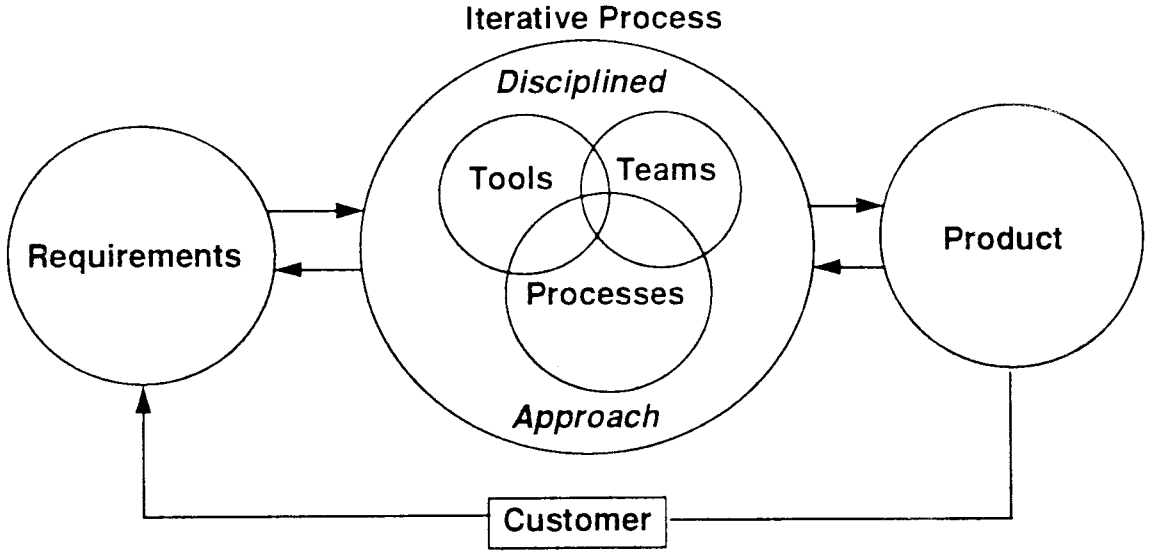

Figure A-27

a. **Requirements.** The requirement source for this model can be any number of customers, i.e. an operational user, other team members, HQ, System Program Director, Product Group Manager, Materiel Group Manager, supervisor, other team, other program, Air Staff, patient.... The requirement can be as simple as a conversation or coordination on a piece of correspondence, to a new requirement for programmed depot maintenance. Knowing who your customer is and the specific requirement will be key to your successful accomplishment of the requirement.

b. **Tools.** The tools utilized will be dependent upon the scope of the effort required to achieve the requirement. The tools can range from a telephone or piece of paper, to an elaborate test program, or new equipment in a hospital. The tools should be chosen by the team. These tools may be existing tools or newly created tools. A link or common thread between tools being utilized will present data regarding accomplishment of the requirement in a consistent, easily recognizable, and therefore easy to react to method. The integration of the data, so that all members of the team are a part of all decisions relative to achievement of

the requirement, will greatly enhance the quality, timeliness and cost effectiveness of your product.

c. **Teams.** The team is composed of whoever has a stake in the outcome of activities relative to the achievement of the requirement. The degree of involvement and role of the individual team members will depend upon the requirement and the processes chosen for accomplishment of the requirement.

d. **Processes.** The processes utilized will be dependent upon the scope of the activity required for the achievement of the requirement. Processes could include anything from a telecon to a major acquisition. All team members should be involved in the processes, bringing to bear their functional expertise, toward achievement of the common goal of the team - delivery of a product that meets the requirement.

e. **Product.** This integration of tools, processes and people utilizing a disciplined approach should produce a product which meets the customer's requirement in the most cost effective manner consistently.

f. **Feedback.** Continuous feedback regarding the health of your efforts should be achieved through the utilization of metrics. The metrics should be consistent with the scope of the effort, and should provide meaningful indications of the health of your activities.

IF YOU ARE CONSIDERING:	AND	THEN
5. Establishing a performance standard for a employee relating to	a. The work is covered in the position description.	a. As early as possible during the appraisal element and cycle, establish elements and standards in the civilian Performance Plan that addresses the team participation responsibilities and expected results of team participation.
	b. Is not covered in the position description or core document.	b. Revise the position description or core document to describe the employee's responsibilities to the team. Contact the base Civilian Personnel Flight for details.
6. Rewarding civilian members of a team for a team effort		Consider issuing either a Notable Achievement Award, Special Act or Special Service Award or Time-Off Incentive as outlined in Civilian Personnel Regulations. Consider non-monetary awards such as plaques, organizational certificates, letters of commendation. Consider informal recognition such as at Commander's Call, Staff Meetings, Article in Newspaper,.... Contact the base Civilian Personnel Flight for additional information.

IF YOU ARE CONSIDERING:	AND	THEN
5. Establishing a performance standard for a employee relating to	a. The work is covered in the position description.	a. As early as possible during the appraisal element and cycle, establish elements and standards in the civilian Performance Plan that addresses the team participation responsibilities and expected results of team participation.
	b. Is not covered in the position description or core document.	b. Revise the position description or core document to describe the employee's responsibilities to the team. Contact the base Civilian Personnel Flight for details.
6. Rewarding civilian members of a team for a team effort		Consider issuing either a Notable Achievement Award, Special Act or Special Service Award or Time-Off Incentive as outlined in Civilian Personnel Regulations. Consider non-monetary awards such as plaques, organizational certificates, letters of commendation. Consider informal recognition such as at Commander's Call, Staff Meetings, Article in Newspaper,.... Contact the base Civilian Personnel Flight for additional information.

IF YOU ARE CONSIDERING:	AND	THEN
7. Rewarding a military member of a team Achievement for a team effort		Consider issuing a Letter for a Team Medal, Time-Off (3-day pass). Military Personnel cannot receive monetary awards. Consider informal recognition such as at Commander's Call, Staff Meetings, Article in Newspaper,.... Contact the base Military Personnel Flight for awards or the local Orderly Room for issues concerning time-off incentives.

NOTES:

1. Informal IPT means IPT formation does not require organization change, i.e., change to UMD and/or civilian position description core document. Informal IPTs can include PATs, Tiger Teams, and matrix management.

2. Formal IPT means IPT formulation which requires changes to UMD and/or civilian position description core document

3. Matrixing is a management concept of consolidating like functional skills into one organization and placing individuals with these skills into the organization of the program he or she supports.

4. Information may also be available from the Resource Management functions within the organization.

ATTACHMENT C. REFERENCES

Contents:

ATTACHMENT C-1. A PARADIGM FOR 21ST CENTURY MANAGEMENT

1. Models for management continue to evolve. Today companies are finding that the old model of a big headquarters staff, pushing reams of paper is killing their ability to compete. In place of the centrally controlled and directed operation (Figure C-1) we are seeing the evolution of the centrally controlled, decentrally executed operation (Figure C-2). This new model has been the basis for some remarkable corporate revival stories and it is the foundation for management in the next century.

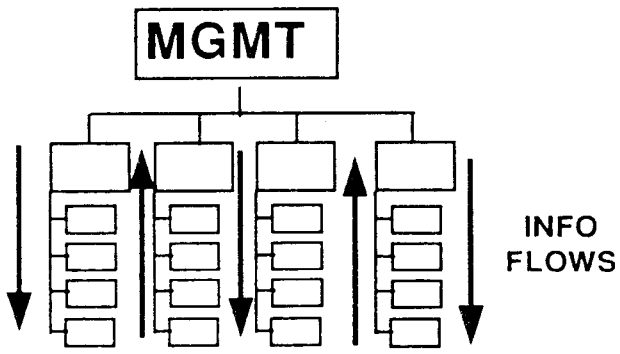

Figure C-1

2. Figure C-2 illustrates the paradigm (model) upon which many organization have been rebuilt. As the organizations restructured themselves they restored "Customers" (and satisfying their

needs with "Products") to their rightful place of being the reason for the organizations existence. This key principle has been incorporated into such diverse areas as the USAF (AFMC, ACC, AMC) automotive (Saturn, Ford and Chrysler,) electronics (Motorola, IBM's Lexmark printer division) and aerospace (Boeing 777.) Interestingly this model can be applied equally effectively to the top of an organization such as AFMC or Boeing or to a 40 people machine shop. It works for big projects (i.e. Chrysler latest car and Saturn) and IPTs working on components. What follows is an explanation of each element of the paradigm.

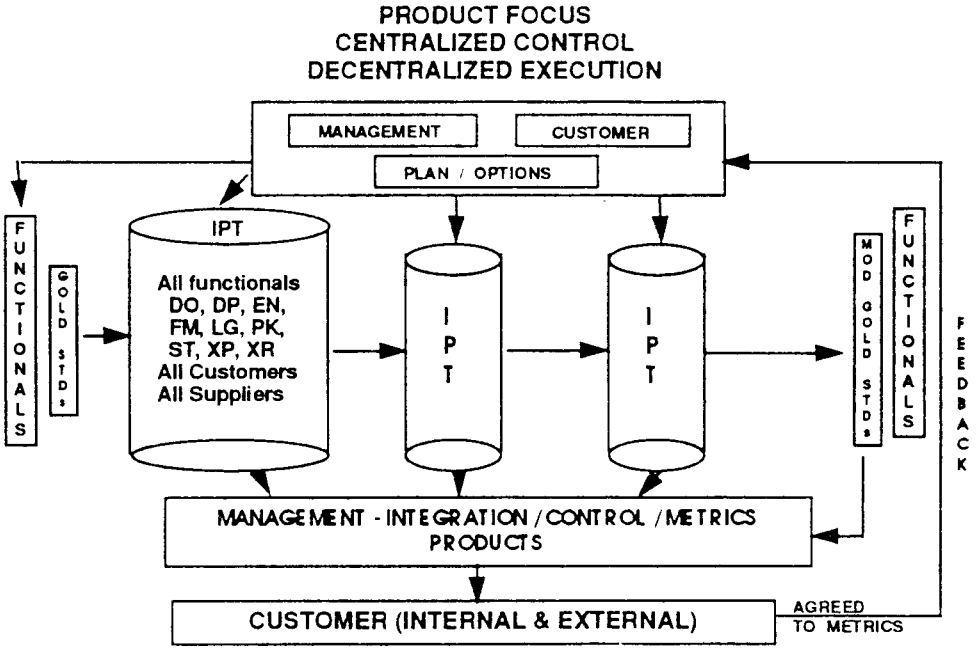

Figure C-2

3. The key element of the paradigm is its focus on the customers and satisfaction of that customers needs by delivering products. In most cases it is easy to determine who the customer is. Determining the customers "needs" is a much more difficult job, but absolutely critical to success. The customer is shown next to management and over the products definition stage. Customer input takes many different forms, but success requires that it happen or the customers needs will not be correctly identified. Failing to correctly define what the customer needs is the major cause of failure in today's world, but it is avoidable. Once the customers needs are clearly identified, they are translated into a product description. The agreed upon definition becomes the focus of the organization with trades in the product description being made as part of a balanced approach to satisfying the customer's needs.

4. The second key element is the IPTs. In the old model, functional organizations (finance, engineering, etc.) had control of their disciplines and tended to optimize their efforts to the

detriment of the success of the overall effort. Using IPTs, the emphasis shifts back to the product. The functionals are integrated into a team charged with getting the optimum product out the door. By changing the focus to the product (customer) and empowering the team to make tradeoffs, the optimization happens at the product level. Note the arrangement of the functionals and their "Gold Standards" (best practices) for conducting their disciplines. Under the new paradigm the functionals must strive for optimized products, and to do this, it is necessary to sub-optimize their processes. For example, a financial manager may want more detail then is really required to prudently manage. Since the product is the focus, the financial manager would have to settle for a lower level of detail.

5. These key elements apply to everyone and every process involved in the operation. The customer is king and the product takes priority over everything else. Everyone from the CEO to the janitor gets a new job description that includes making the products better, delivering them quicker and continuously improving everything associated with the operation. Call it what you like (Total Quality Management, Quality Air Force, etc.) the mindset of every person in the organization shifts into being a partner (versus an employee.) Managers relinquish hands-on control over many decisions and empower individuals to take control of their processes and responsibility for their products. In return for giving up control, managers get people actively involved with their processes and interested in their products.

6. Managers don't forget about control but the new control takes the form of metrics. Metrics are measurable parameters agreed to by those running a process and the manager as representing good thing to track. Metrics may take many forms, but they represent another agreement between management and workers, where control is centralized but execution is decentralized.

7. This paradigm for management in the 21st century is being implemented in AFMC at the heart of the IWSM philosophy. It effects every aspect of the command and its operation.

ATTACHMENT C-2. IPD DEFINITION LETTER

FROM: HQ AFMC/XR *13 Jan 93*
4375 Chidlaw Road, Suite 6
Wright-Patterson AFB OH 45433-5006

SUBJ: Integrated Product Development (IPD)

TO: AL/AFMC/CC

1. In the White Paper: Integrated Weapon System Management in AFMC, dated 28 Jan 92, General Yates identified teams built upon the IPD philosophy as one of the guiding principles to govern our operating concepts. It is General Yates' intent to encompass the entire scope of the AFMC mission as we implement IPD. It is important to realize that this philosophy is broader than any specific organizational construct. General Yates has directed, through the HORIZONS process, the implementation of IPD across AFMC by Oct 93. In order to do this, we must have a common understanding of IPD.

2. IPD is a philosophy that systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient product that satisfies customers' needs. Product, in this sense, is not only what is delivered to your customer (e.g., hardware, software, services, and documents), but also the processes (e.g., design, manufacturing, test, and logistics) which make the product possible. Products range from complete weapon systems to individual end items and from request for proposals to briefings, as well as policies like those for the Integrated Acquisition Strategy Process and the Configuration Control Board.

3. IPD builds on the concepts we have all applied in various forms in the past. In order to implement IPD, it is important to understand its tenets:

a. IPD requires a product focus and a complete understanding of the processes required to optimize the product.

b. IPD will encompass all products and processes, regardless of the point in their life cycle.

c. The life cycle of a product or process will be integrated through thorough, up-front planning that must include all functions, customers, and suppliers.

d. All functions that impact the achievement of the customers' requirements should be applied concurrently, in a team fashion, throughout the life of a product or process.

e. A framework must be established which relates products and processes at all levels to demonstrate dependency and interrelationships. This hierarchical interrelationship must be understood and appropriate partnerships established to ensure that all decisions are optimized toward the ultimate user's end product.

f. Decisions must be driven to the lowest possible level commensurate with risk. Resources should be allocated at levels consistent with authority, responsibility, and ability of the people.

g. People must function as a team. Team success, facilitated by rapid, open communication, must be emphasized and rewarded. Management relationships must be developed which are consistent with and focused on achieving the team's measurable goals and objectives.

h. Embracing the IPD philosophy requires purposeful, multidisciplined teamwork. The sequence of focus for IPD should be:

(1) The customer

(2) The product

(3) The process

(4) Constraints

(5) Organizational structure

4. To make this cultural change, General Yates has designated HQ AFMC/XR as his lead for the command-wide implementation of IPD. As such, I have formed a steering committee whose membership includes HQ AFMC/DO/DP/EN/FM/LG/PK/ST/XP, the vice commanders from WR-ALC, OC-ALC, ASC, ESC, SAF/AQX, and AFPEO/ST. The steering committee is chartered to provide guidance to the field, facilitate timely resolution of issues, and interface with the Air Force Acquisition Executive, PEOs, and Designated Acquisition Commanders. In addition, a working group has been established to facilitate the implementation of IPD command-wide. The working group will facilitate the identification and resolution of issues, recommend policy and guidance, examine metrics, identify and facilitate initial education and training, and keep the field informed on all issues relating to IPD. The working group will provide a recommended approach for each of these topics to the steering committee for review and approval.

5. IPD will require a relook at how the command does business. Models, tools, policies and procedures, and metrics will be identified or developed to ensure effective use of our scarce resources. We know a number of you are currently working IPD very hard, and we want to capitalize on what you have learned. However, it is important to understand that the IPD philosophy will take different shapes to fit the needs of various environments. We have put this project on an ambitious schedule so you can anticipate further information in the near future.

FOR THE COMMANDER

//signed//
JAMES A. FAIN, JR.
Major General, USAF
DCS/Requirements

ATTACHMENT C-3. BREAKDOWN OF IPD DEFINITION

In order to fully understand the definition of IPD, lets examine each part.

A philosophy - IPD isn't something you can see or touch, rather it is a thought process, a mindset. As defined by Webster, a philosophy is: "general beliefs, concepts, and attitudes." Implementing IPD requires a shift in our current paradigms. The culture must be ripe for change. The concept needs to be embraced by all within the team.

That systematically employs - IPD requires a disciplined approach. First you understand the requirements, then outline what to accomplish. Next you establish an event driven plan with success criteria. Finally you develop a schedule of events. When this is completed, resources are allocated.

A teaming of functional disciplines - All functional representatives looking at issues from a broad sense, not just functional perspective. IPD uses skill synergy: a group of assigned personnel that compliment one another in skill and temperament, to ensure rapid, accurate action and to make an integrated set of timely decisions. The team needs to include customers, contractors, and suppliers. Team success will only be met through open communication.

To integrate and concurrently apply - IPD is an integrated decision process versus a functional based decision process. A fully integrated management system focusing on the product.

All necessary processes to produce - This includes all processes required to develop the product; i.e. design, manufacturing, test, contracting, etc. This also includes the Integrated Acquisition Strategy Process, Mission Capability (MICAP) process, Mission Element Board process, design, manufacturing, customer service....

An effective and efficient - Meets the requirements.

Product - A product is everything we do in AFMC. A product is what is delivered to the customer; i.e. hardware, software, services, documents, correspondence, communication, etc.

That satisfies customer's needs - This is the reason for our existence and our ultimate goal.

ATTACHMENT C-4. IPD WHITE PAPER

DEPARTMENT OF THE AIR FORCE
Headquarters Air Force Materiel Command
Wright-Patterson Air Force Base OH 45433-5006

Commander's Policy

INTEGRATED PRODUCT DEVELOPMENT

1. I believe Integrated Product Development (IPD) is the management initiative that will enable Air Force Materiel Command to operate most efficiently in this era of diminishing resources. Past successes in industry and within our own programs give me confidence that a product-focused, integrated approach yields better products more quickly and more economically than those produced using traditional approaches. Further, I believe the tenets of IPD can and should be applied to products this Command produces for itself so that we, along with our external customers, will benefit from improved processes, policies and services. IPD is consistent with and compliments other Command initiatives to foster a culture of continuous improvement.

2. The attached White Paper presents the philosophy of IPD and describes the tenets that should guide you as you apply this philosophy to the work you do every day. Many of you already have a head start, and I congratulate you for your initiative. Many more of you must begin now to think and to work together in new relationships that require placing your customer, and the product you provide to your customer, ahead of all other interests. I expect you to embrace the philosophy of IPD and actively seek opportunities to gain its benefits. To achieve the maximum benefits, you will have to tailor its application. I have set October 1993 as the date that you should be able to describe to me how you are proceeding with the implementation of this philosophy across all your activities.

//signed//
RONALD W. YATES, General, USAF
Commander

1 Attachment
White Paper

AFMCR 500-19
21 April 1993

INTEGRATED PRODUCT DEVELOPMENT WHITE PAPER

1. INTRODUCTION

In keeping with our commitment to continuous improvement, the Air Force Materiel Command (AFMC) has adopted Integrated Product Development (IPD) as a management initiative. This paper provides the basic foundation for IPD implementation: a historical perspective, definition and discussion of the tenets of IPD. The IPD philosophy and its basic tools will enable this Command to realize the full benefit of Integrated Weapon System Management (IWSM). IPD provides the framework for organizational relationships that encourage teamwork between ourselves, our customers, and industry.

2. HISTORICAL PERSPECTIVE

a. The IPD philosophy, derived from concurrent engineering, surfaced as a proven technique for combating cost overruns, supportability issues and technology insertion as evidenced in the automotive and electronics industries. Recognizing the need for process change and prompted by the Packard Commission Report, "A Quest for Excellence," June 1986, the Under Secretary of Defense for Acquisition requested the Institute for Defense Analyses (IDA) examine concurrent engineering practices for DOD applicability. Encouraged by IDA's recommendations, "The Role of Concurrent Engineering in Weapon System Acquisition," December 1988, the Under Secretary provided interim acquisition guidance to the Military Services in March 1989, regarding the use of concurrent engineering in the DOD acquisition process . The guidance emphasized formation of multi-disciplined teams for product development. Concurrent engineering is characterized by: (a) a focus on the customer's requirements; (b) quality results from improving a process; and (c) continuing process improvement.

b. The need for swift acquisition process improvement was reinforced when the Secretary of Defense presented the "Defense Management Report to the President" in July 1989. This report specifically targeted DOD Acquisition Practices and Procedures and identified the need for change. Subsequently, DOD Directive 5000.1, was rewritten establishing a disciplined management approach for acquiring systems and materiel that focuses on satisfying the operational users needs.

c. The IPD concept continued to evolve within many Air Force Systems Command programs. One program, the Advanced Tactical Fighter, further expanded these concepts by utilizing an innovative management structure called the Integrated Management System.

d. Through the summer of 1990 and concluding in October 1990, the Air Force Logistics Command reorganized the Air Logistics Centers (ALC's) using the product directorate (team) concept. This reorganization was modeled on the core values of customer and product focus, fast response, teamwork, and continuous improvement. The reorganization disestablished the functional directorates of Materiel Management and Maintenance. In their place, product directorates were created that focused teams of functional experts on specific products or product lines. This effort succeeded in breaking down barriers and reducing layers of supervision throughout the ALCs.

e. Further maturation of IPD stemmed from AFMC and its development of the IWSM approach. The White Paper: "IWSM in AFMC," 28 January 1992, states that program offices "will use a management philosophy known as Integrated Product Development." AFMCR 500-11, 1 November 1992, introduces a fourth key element of the IWSM philosophy - the use of Integrated Product Teams.

f. Recognizing the benefits associated with IPD, AFMC/CC has directed the implementation of IPD throughout AFMC by October 1993. A Steering Committee, chaired by HQ AFMC/XR, has been established to facilitate the timely resolution of IPD implementation issues within the command.

3. DEFINITION

a. The IPD Steering Committee has developed and published a concise definition of IPD and its underlying tenets (HQ AFMC/XR letter, 13 January 1993). The IPD definition builds on concepts employed by many programs in the past. The following is the AFMC definition of IPD:

> *Integrated Product Development is a philosophy that systematically employs a teaming of functional disciplines to integrate and concurrently apply all necessary processes to produce an effective and efficient product that satisfies customer's needs.*

b. Product, in this sense, is not only what is delivered to your customer (e.g., hardware, software, services, and documents), but also processes (e.g., design, manufacturing, test, and logistics) that make the product possible. Products range from complete weapon systems to individual end items and from request for proposals to briefings, as well as policies like those for the Integrated Acquisition Strategy Process and the Configuration Control Board.

4. PHILOSOPHY

a. IPD is one of the elements of IWSM. As such, it applies to the entire scope of the AFMC mission and to the entire life cycle of a product. The management framework espoused by IPD applies throughout the product's life cycle. IPD applies to all products delivered to a customer as well as the processes used to deliver those products.

b. The effective implementation of IPD, consistent with IWSM, requires a cultural change in how we do business as a command. We must change the way we relate to our internal and external customers. This change is best facilitated by a management framework that focuses the resources on the products delivered to the customer. This management framework will use cross-functional teams and institute a deliberate, up-front planning effort that focuses the teams early in the development or management of the product.

c. The consistent application of IPD will reap several benefits. By ensuring all appropriate functions are involved in the decision-making process for a given product, the quality of the product will improve, the time required to produce that product will be reduced, and responsiveness to changes in customer requirements will increase. Inherent in this utilization of IPD is a reduction in the cost due to redesign and rework. The IPD management philosophy relies on teams, and provides the framework for team organization and management. The result is a more effective management process producing a higher quality product.

5. TENETS

IPD builds on concepts, or tenets, we have all applied in various forms in the past. In order to effectively implement IPD, it is important to understand the interrelated tenets inherent in IPD.

(1) Integration Throughout the Life Cycle. IPD will encompass all products and processes, regardless of the point in their life cycle.

Products evolve over a life cycle. What begins as a research effort may evolve into a weapon system acquisition and later, may be managed as a subsystem. Planning and planning processes must recognize this evolution while ensuring the continuity of management and management information throughout the product's life cycle. Organizational structures may also evolve to reflect the needs of the product in the life cycle. These changes may involve team composition, tools, and/or processes. The management structure and the tools must recognize and support this evolution.

*(2) **Product Focus. IPD requires a product focus and a complete understanding of the processes required to optimize the product.***

AFMC products take several forms, e.g., technology, hardware, software, programmed depot maintenance, repair of line replaceable units, services, processes, and policy. In each case, the product forms the cornerstone of the organization's business focus. The product delivered will dictate the ultimate success of our efforts in the eyes of the customer. Processes (i.e., contracting, financial management, engineering, etc.) required to deliver the product to the customer must be understood in order to make the necessary trades to optimize the product.

*(3) **Seamless Management Tools. A framework must be established that relates products and processes at all levels to demonstrate dependency and interrelationships. This hierarchical interrelationship must be understood and appropriate partnerships established to make sure all decisions are optimized toward the ultimate user's end product.***

A single management system must be established that relates requirements, planning, resource allocation, execution, and program tracking over the total life cycle. This integrated approach ensures teams have all available information to enhance team decision making at all levels, independent of the product's life cycle. These product-oriented teams ensure integration of products and processes that leads to increased customer satisfaction.

*(4) **Up-front Planning. The life cycle of a product or process will be integrated through comprehensive, up-front planning that must include all functions, customers, and suppliers.***

Up-front planning, which includes all functions, customers, and suppliers over its life cycle, lays a solid foundation for the various phases of the DOD acquisition and sustainment process. The first step in the planning process is to define the key program events that must take place. The focus should be on events, not schedules or resources. When the required program events are clearly defined and understood, then resources can be applied and the impact of resource constraints can be better understood and managed.

*(5) **Cultural Change. Embracing the IPD philosophy requires purposeful, multi-disciplined teamwork. The priority of focus for IPD should be:***

(a) The customer
(b) The product
(c) The process
(d) Constraints
(e) Organizational structure

Implementation of IPD requires a multidisciplined approach to ensure that we have brought all necessary skills and perspectives to bear on the product. The order of priorities listed above should guide the team through the development of its management and decision-making processes with emphasis on defining the cultural changes necessary to implement IPD. Embracing IPD may or may not require a structural change to the organization.

(6) ***Right People, Right Place, Right Time. All functions that impact the achievement of the customer's requirements should be applied concurrently, in a team fashion, throughout the life of a product or process.***

The right people should be brought to the right place at the right time to make decisions concerning the product. Life cycle decisions are based on the combined input of engineering, manufacturing, logistics, financial management, contracting, test, and all other appropriate disciplines, to include customers and suppliers. The integration of functional experts in this way enhances functional influence throughout the life cycle of the product.

(7) ***Empowerment. Decisions must be driven to the lowest possible level commensurate with risk. Resources should be allocated at levels consistent with authority, responsibility, and the ability of the people.***

Making decisions at the lowest appropriate level in an organization leads to a more complete use of the organization. This empowerment is effective because the right people have a direct and visible input to the product. In addition, the data available at lower levels is less filtered by management layers and may, therefore, be more precise. The teams at each level use this data to evaluate the risk associated with their product. They must be given the authority, responsibility, and resources to manage their product and its risk. The team must accept responsibility and be held accountable for the results of their effort.

(8) ***Teamwork and Communication. People must function as a team. Team success, facilitated by rapid, open communication, must be emphasized and rewarded. Management relationships must be developed that are consistent with and focused on achieving the team's measurable goals and objectives.***

Effective communication and planning are the keys to successful teaming. Communication must be open, free flowing, and help each team member understand the contributions of the other members, as well as the constraints that other team members operate within. Supervisors and leaders should encourage open communication by acknowledging and rewarding team achievements. In addition, teams must focus on achieving goals and objectives. One way to channel this focus is to develop a metrics system that facilitates meaningful data collection and presentation. Metrics foster process understanding and motivates actions for continuous product and process improvement. Team building at the start of a project, as well as at key

milestones, is essential to effective teams. Stability in team membership must be weighed against the need for individual growth and development

6. RELATIONSHIP OF IPD TO OTHER COMMAND INITIATIVES

As a key element of IWSM, the IPD characteristics are inherent in IWSM. In addition, IPD shares many useful, synergistic characteristics with two other AFMC management initiatives, Total Quality Management (TQM) and Theory of Constraints (TOC). These initiatives share as their primary focus altering the organizational culture to a process of ongoing improvement. All are philosophies aimed at continuously improving the process and product that yield customer satisfaction. Ten principal core values and concepts of TQM, taken from the 1992 Malcom Baldrige Award Criteria are listed below with a description of the relevant TQM, TOC, and IPD objectives:

(1) Customer Focus. TQM, TOC, and IPD stress customer focus and analyze the value and effectiveness of the total system from a customer's perspective; specifically "right product, right place, right time, right price, and right service".

(2) Quality Leadership. TQM, TOC, and IPD emphasize a revised role for the organizational leader, rather than the authoritarian role of the traditional hierarchical pyramid. The new leader is coach, trainer, resource provider, and policy or strategy maker. TOC further defines the new leader's role as "Socratic," with three tasks: (a) determining what to change, (b) what to change to, and (c) how to change.

(3) Continuous Improvement. All three philosophies assume a competitive environment where the customer has a choice and increasingly higher expectations of our products that demand continuous process improvement.

(4) Employee Empowerment and Teamwork. All three philosophies stress capitalizing on total system optimization by involving all functional skills in an integrated decision-making process. TQM and IPD go further and stress employee development through structured training, experience, career enrichment, and recognition.

(5) Fast Response. All three philosophies see product cycle time as a major competitive advantage. They recognize the relationship between cycle time reduction, increased product quality, lower overall costs, and responsiveness to changing customer requirements.

(6) Quality Design. Although the title is different, all philosophies recognize the fundamental concept of concurrent engineering. In order to have the best product, it is imperative to obtain and employ, during design, the expertise of all subsequent process interfaces (manufacturing, test, operational use, repair, modification, disposal, etc.).

(7) Long Range Strategy. IPD and TQM stress that the organization must plan on a long term horizon, and deploy energies and resources through a quality plan to achieve the objectives. TOC stresses a road map process that identifies the corporate goal and then selects where the organization wants to have its system constraint. All three philosophies support the concept of continuous reevaluation.

(8) Management by Fact. TQM stresses flow charting and analyzing processes and establishing process check points to determine the health of the process. In addition, all philosophies stress accurate measurement and open, free-flowing communication. TOC emphasizes information, not just data, particularly at the system constraint. IPD takes management by fact, and encourages a decision information system that integrates all phases of product life through a consistent and logical product breakdown structure.

(9) Partnership Development. All three philosophies speak to the power of integrated teams and partnerships beyond the bounds of organizational or command lines.

(10) Public Responsibility/Systems Perspective. Beyond the active partnerships of customers, teams and suppliers, IPD, TQM, and TOC recognize that the "whole" system goes beyond the boundaries of the product, to include the community and environment wherein the product is developed, tested, manufactured, used, repaired, and disposed.

7. SUMMARY

In this paper we have outlined the basic definition and tenets that are needed to effectively implement IPD throughout the command. Applying the IPD philosophy will result in significant benefits to your organization and the products you deliver. IPD is the philosophy that will enable AFMC to successfully achieve its mission. AFMC is committed to seeking better ideas and more effective and efficient ways to accomplish its mission:

> *Through integrated management of research, development, test, acquisition, and support, we advance and use technology to acquire and sustain superior systems in partnership with our customers. We perform continuous product and process improvement throughout the life cycle. As an integral part of the Air Force War Fighting Team, we contribute to affordable combat superiority, readiness, and sustainability.*

ATTACHMENT C-5. Early Industry Involvement in Acquisition Planning

OFFICE OF THE ASSISTANT SECRETARY
DEPARTMENT OF THE AIR FORCE
WASHINGTON DC 20330-1000

20 JUNE 1991

Acquisition Policy 91M-001

MEMORANDUM FOR DISTRIBUTION

SUBJECT: Early Industry Involvement in Acquisition Planning - ACTION MEMORANDUM

It is Air Force policy to facilitate early, open, and effective communication between industry and government during the acquisition planning process. This early communication is vital to achieving ultimate program success. Therefore, we have adopted an approach built on a foundation of teamwork for the acquisition planning and Request for Proposal (RFP) process. This approach consists of three phases described in Attachment 1 - Initial Acquisition and Strategy Development, Acquisition Strategy Coordination, and Formal Request for Proposal Preparation. In each phase, appropriate methods of communication, described in Attachment 2, will be used to provide information, solicit and receive industry comments and ideas, provide meaningful feedback, and most importantly, to produce a formal RFP that incorporates a sound acquisition strategy based on clear and well understood requirements.

Program Managers (PMs) or System Program Managers (SPMs) shall apply this three-phased approach and integrate it into their acquisition planning for all competitive acquisitions of systems, subsystems, modifications, maintenance or overhaul estimated at $25 million or more. The PM or SPM and the Procuring Contracting Officer (PCO) shall jointly decide the level of industry involvement needed and may tailor or modify portions of procedures not prescribed by law or regulation. This approach may also be applied, in whole or in part, in other acquisitions as jointly determined by the PM/SPM and the PCO.

In applying this approach, two area are critical. First, we must comply with rules concerning the release of acquisition-related information. All documents to be provided to industry must be carefully reviewed to preclude the inadvertent release of proprietary, source selection, or other information requiring protection. Second, we must ensure potential offerors are treated fairly by providing equal access to information to all known potential offerors.

Program Managers or System Program Managers will authorize the release of documents through the PCO and the PCO shall be the single point of contact for communicating with industry.

This policy is fully consistent with DoDI 5000.2, the FAR and DFAR, and AF Acquisition Policy 90M-017, which implemented the DOD Interim Rule on Release of Acquisition-Related Information. When properly utilized by acquisition professionals, both in government and industry, it will foster continuous improvement in the Air Force acquisition process.

/SIGNED/
J. J. WELCH, JR.
Assistant Secretary of the Air Force
Acquisition

2 Atch
1. Three-Phased Approach
2. Methods of Communication

ACQUISITION POLICY
EARLY INDUSTRY INVOLVEMENT IN ACQUISITION PLANNING
THREE-PHASED APPROACH

Phase 1: Initial Acquisition and Strategy Development

This phase begins as soon as possible after the initial requirement is communicated to the PM or SPM, continues through the formulation of the acquisition strategy and ends with the convening of the Acquisition Strategy Panel.

Requests for Information (RFIs) and presolicitation conferences are the primary means of communicating with industry during this phase. Communications during this phase should focus on technology and production availability, risk and cost driver identification, and strategy alternatives. This communication proves an opportunity to take advantage of industry's good ideas. The PM and SPM should establish a Program Technical Library and may authorize the use of Electronic Bulletin Boards.

An analysis of significant industry comments and our responses shall be presented to the Acquisition Strategy Panel for its consideration. These comments and responses shall be documented and made available to all firms included on the Source List (includes RFI respondents and presolicitation conference attendees). Providing this feedback allows industry to:

a. Understand the development of the strategy as the program proceeds through the acquisition process,

b. Have a reliable source of information upon which to base their mid-to long-range plans, and

c. Better understand the requirement by gaining insight into the acquisition strategy and thought process behind it.

Phase 2: Acquisition Strategy and Coordination

This phase begins with the conclusion of the Acquisition Strategy Panel and ends with the release of the Draft RFP (first iteration, if more than one release is planned). Program Technical Libraries, Electronic Bulletin Boards and Presolicitation Conferences are the principal forms of communication with industry during this phase. Here the communication should focus on cost/benefit/risk assessment, technology readiness, and available trade-offs, as

well as program alternatives. Industry helps shape the acquisition through review of documentation in its draft stage.

The comments on the draft documents are directed back to the drafter through the PCO before the document becomes final. Also, the PM or SPM may refine the overall acquisition strategy based upon this information.

Phase 3. Formal Request For Proposal (RFP) Preparation

This phase begins with the release of the Draft RFP (DRFP) and ends with the release of the RFP. The principal form of communication with industry is the DRFP; however, other forms, such as Program Technical Libraries, Electronic Bulletin Boards, and Presolicitation Conference are available. All previous comments are consolidated and incorporated into the DRFP (where appropriate).

Comments received during this phase focus on realistic schedules, technology and production trade-offs, and cost or schedule drivers and trade-offs. Comments received are evaluated for incorporation into the RFP. The PCO shall respond to all comments, advising the potential offerors of the disposition (including rationale) of each comment.

ACQUISITION POLICY
EARLY INDUSTRY INVOLVEMENT IN ACQUISITION PLANNING
METHODS OF COMMUNICATION

a. Electronic Bulletin Boards. These carry long-range acquisition information, CBD announcement information, and local items of interest. These bulletin boards may be expanded to include program specific information. The PM or SPM may authorize the use of the bulletin board to provide an inventory of documents found in the Technical Library (if used), and acquisition schedule for key events, and other items of interest affecting the program. The PCO approves all items to e included on the bulletin board. Availability of the bulletin board must be announced in the CBD and may be combined with other announcements. All offerors must be afforded equal and open access to the electronic bulletin board.

b. Program Technical Library. This is a central location where key program documents are made available for potential offerors' review. PMs and SPMs determine which documents (and at what stage of their development) are placed in the library. The PCO, in conjunction with the PM or SPM, oversees the operation of the library; publicizes its existence; and receives, evaluates, and disposes of all questions or comments generated. Every effort should be made to ensure that all potential offerors have equal and open access to the information contained in the library. All firms visiting the library must be included on the future source list, unless the firm specifically declines.

Program Technical Libraries may include classified date; however, the access to that data will be controlled in accordance with appropriate security publications (DoDD 5220.22-R, DoDD 5220.22-M, and DoDD 5200.1R/AFR 205-1). Planning, Programming, and Budgeting System (PPBS), proprietary, source selection, and other information for which release is restricted by AF Acquisition Policy Memorandum 90M-017 shall not be included in the Program Technical Library.

c. Request for Information (RFI) Announcement. An announcement may be placed in the Commerce Business Daily (CBD) to provide a broad statement of need, describe the Government's intentions regarding program/acquisition approach, and identify key events in the RFP and program schedule. In addition, the announcement requests industry comments on how the Government can satisfy its needs, alternative acquisition approaches, technology and production availability, identification of risk and cost drivers, and suggestions on ways to enhance or sustain competition.

d. Request for Information (RFI). A letter may be issued by the PCO to provide and request the same information outlined in paragraph c above. Letters to individual prospective

offerors must contain identical information to ensure that no offeror is given an unfair competitive advantage.

e. Presolicitation Conference(s) with Industry (FAR 15.409). The PM or SPM may determine that a face-to-face meeting or conference with industry may be beneficial. The PCO or designated representative shall conduct the presolicitation conference, furnish all prospective offerors identical information concerning the proposed acquisition, make a complete record of the conference, including questions and responses, and promptly furnish a copy of that record to all firms in attendance and to any others to whom the solicitation will be provided. If a Program Technical Library has been established, a copy of the conference minutes shall be included in the library.

Presolicitation conferences may be conducted collectively or individually. If the PM or SPM and the PCO elect to conduct individual conferences, extreme care must be exercised to ensure that the potential offeror is not afforded and unfair competitive advantage by virtue of the individual conference. All offerors must be provided identical information.

f. Draft RFP. The Draft RFP is a formal release of a projected RFP (or portions thereof) in the intended format (Uniform Contract Format). The purpose of the DRFP is to obtain industry input on the intended RFP in order to identify and eliminate overly burdensome requirements, reduce costs, and facilitate advance planning. DRFPs should be as complete as possible. However, incremental and repetitive release of portions of the RFP are authorized to enhance the quality of the RFP and to ensure a clear statement and understanding of requirements exist.

g. Ombudsman. Each AFSC Product Division and AFLC Air Logistics Center has established an Ombudsman to serve as a channel for industry comments on a non-attribution basis. The Ombudsman should be identified in each of the methods of communication described above.

PROVIDING FEEDBACK:

Each comment obtained as a result of using one ore more of the above methods of communication must be addressed. When multiple comments are received essentially addressing the same area, they may be evaluated and responded to as a group rather than individually. Special care should be taken to ensure that in accepting a comment for incorporation into the RFP, no unfair competitive advantage is provided to any offeror.

ATTACHMENT C-6. IPD AND TOTAL QUALITY

Embedded in IPD are seven of the key principles of Total Quality. They are customer satisfaction, teamwork, management commitment, continual improvement, work processes, training, and people as a critical resource. (This section is summarized from Report Number AL-TP-1991-0037, A Quality Philosophy for Integrated Product Development, August 1991)

1. **Customer Satisfaction:** This is the ultimate objective of IPD and it starts with an understanding of the customer's requirements.

2. **Teamwork:** IPD requires a multidisciplined team, pulled from all stakeholders, and chartered to address issues impacting the overall product. The IPD approach requires a product teaming structure characterized by open communication among team members, access to evolving information, concise understanding of roles and responsibilities, and commitment to the product versus commitment to the functional "home" office.

3. **Management Commitment:** For IPD to work effectively, there must be teamwork among the team members, open lines of communication among the team, and a commitment on the part of management to give the IPT the time and resources necessary to achieve success. However, in the past, we have created functionally aligned, stovepipe organizations characterized by independent specialized areas, formalized communication channels, and intense management scrutiny. For IPD to succeed, these organizations must break through this paradigm and management must allow a new culture to evolve. Management must create a climate in which the IPD philosophy can flourish. Management must set goals for the organization and empower the IPTs to make the required product a reality. Management must share their power with the individuals of the organization; this requires a strong commitment.

4. **Continual Improvement:** IPD requires continual improvement of the processes by which the product is developed. This will give you an improved product in less time and cost and a satisfied customer. In the "development" world this does not necessarily mean continually improving the design characteristics and attributes of a system, but to improve the design process.

5. **Work Processes:** IPD can reduce development time through the early identification and resolution of life-cycle concerns for the product. Early identification and resolution of problems avoids costly, time-consuming rework later in the effort. Studies indicate up to 70% of life cycle cost drivers are locked into a product after 20% of the development time has been expended. This 70/20 relationship provides IPD the potential to reduce cost and development time, and increase quality through improved processes.

6. **Training:** With IPD, a broad-based training program which focuses on individual needs and desires is the best overall training approach. The organization must provide the necessary training to bring the team members to the appropriate level of proficiency. The team needs training to understand the basic roles and functions of each member of the team. Members of the multi-disciplined teams need improved methodologies, techniques, and tools to handle the complex integrated decision process as well as the necessary training to employ them.

7. **People as the Critical Resource:** IPD recognizes that people are a very valuable resource. Management alone is not responsible for managing and developing a product. If management represents ten percent of the organization, 90% of the organizational brain power is ignored. IPD embraces continual process improvement and puts 100% of an organization's brain power to work improving and developing a product. IPD recognizes that the decision process is accomplished by members of the IPT. The concept of a multidisciplined team collectively addressing life-cycle issues for the product and making decisions regarding tradeoffs, stresses the importance of qualified and motivated individuals within the IPT.

ATTACHMENT C-7. IPD POINTS OF CONTACT

Each AFMC center and HQ AFMC Directorate has an IPD Point of Contact that is willing to assist you with questions about IPD. If you do not know who your center POC is, you can find the POC list in the IWSM Bulletin Board in the IPD section of the Documents Library, or contact HQ AFMC/XR.

ATTACHMENT C-8. ACRONYMS

ACR	Authorization Change Request
AFLC	Air Force Logistics Command
AFMC	Air Force Materiel Command
AFMCR	Air Force Materiel Command Regulation
AFSC	Air Force Systems Command
ALC	Air Logistics Center
APB	Acquisition Program Baseline
ATF	Advanced Tactical Fighter
CAID	Clear Accountability in Design
CAMS	Core Automated Maintenance System
CAP	Corrective Action Plan
CCB	Configuration Control Board
CCD	Command Case Directive
CCM	Command Country Manager
CCP	Contract Change Proposals
CDMS	Contracting Data Management System
CDR	Critical Design Review
CDRL	Consolidated/Contracts Data Requirements List
CE	Concurrent Engineering
CLSSA	Cooperative Logistics Supply Support Agreement
CMCS	Case Management Control System
CMF	Command Management Framework
COD	Cooperative Opportunities Documents
CONOP	Concept of Operations
CTF	Combined Test Force
DLA	Defense Logistics Agency
DMMIS	Depot Maintenance Management Information System
DO41	Recoverable Consumption Items System
DO62	Consumable Item Computation System
DO87N/D200C	Equipment Item Requirements Computation
DOD 5000.1	Major and Non-major Defense Acquisition Programs
DOD 5000.2	Defense Acquisition Management Policies and Procedures
ECP	Engineering Change Proposal
EDCARS	Engineering Data Computer-Aided Retrieval System
EOQ	Economic Order Quantity
ES	Equipment Specialist
ETADS	Enhanced Transportation Automated Data System
EWSIP	Electronic Warfare System Implementation Program
FCA	Functional Configuration Audit
FMS	Foreign Military Sales

GO72E	Repair Requirements Computation System
IASP	Integrated Acquisition Strategy Process
IDA	Institute for Defense Analyses
IEMP	International Engine Management Program
IM	Item Manager
IMD	Initial Manpower Determination
IMP	Integrated Master Plan
IMS	Integrated Master Schedule
IMS	Inventory Management Specialist
IOD	Integrated Organizational Development
IPD	Integrated Product Development
IPPD	Integrated Product and Process Development
IPT	Integrated Product Teams
IWSM	Integrated Weapon System Management
IWSM BB	Integrated Weapon System Management Bulletin Board
LOA	Letter of Offer and Acceptance
LOR	Letter of Request
LSA	Logistics Support Analysis
MEB	Mission Element Board
MGM	Materiel Group Manager
MICAP	Mission Capable
MIL-STD 490	Specification Practices
MIL-STD 499B	Engineering Management
MIL-STD 881	Work Breakdown Structures for Defense Materiel Items
MIL-STD 973	Configuration Management
MIL-STD 1388	Logistics Support Analysis
MNS	Mission Needs Statement
MRRB	Maintenance Requirement Review Board
ORD	Operational Requirements Document
OSD	Office, Secretary of Defense
OT&E	Operational Test & Evaluation
PAT	Process Action Team
PCA	Physical Configuration Audit
PCO	Procuring Contracting Officer
PDM	Programmed Depot Maintenance
PDR	Preliminary Design Review
PGM	Product Group Manager
PMD	Program Management Directive
PMR	Program Management Review
PMS	Production Management Specialist
PMT	Process Management Team
POC	Point of Contact

PPBS	Planning/Programming/Budgeting System
QAF	Quality Air Force
QFD	Quality Function Deployment
QOT&E	Qualification Operational Test & Evaluation
QT&E	Qualification Test & Evaluation
R&M	Reliability and Maintainability
RDB	Requirements Data Bank
RDT&E	Research, Development, Test and Evaluation
REMIS	Reliability and Maintainability Information System
RFP	Request for Proposal
SAMIS	Security Assistance Management Information System
SAPM	Security Assistance Program Manager
SC&D	Stock Control and Distribution
SEMP	Systems Engineering Management Plan
SEMS	Systems Engineering Master Schedule
SMM	System Maturity Matrix
SOW	Statement of Work
SPD	System Program Manager
SPO	System Program Office
SS	Source Selection
TCP	Technical Coordination Program
TCTO	Time Compliance Technical Order
TIM	Technical Interchange Meeting
TMC	Test Management Council
TOC	Theory of Constraints
TPM	Technical Performance Measures
TPWG	Test Planning Working Group
TQ	Total Quality
TQM	Total Quality Management
TSPR	Total System Performance Responsibility
UMD	Unit Manpower Document
WBS	Work Breakdown Structure

3. **Other Reference Material:**

a. A Quality Philosophy for Integrated Product Development, August 1991, Report Number AL-TP-1991-0037.

b. Results of the Aeronautical Systems Division Critical Process Team on Integrated Product Development, November 1990, Report Number ASD-TR-90-5014.

c. Final Report Government/Industry Acquisition Process Review Team Clear Accountability in Design, October 1991.

d. Integrated Product Development Implementation Guide, Space and Missile Systems Center, March 1993.

e. Early Industry Involvement Reference Material

(1) Federal Acquisition Regulation Part 15.4 -- Solicitation and Receipt of Proposals and Quotations

(2) AFMC FAR 5315.4 and 5315.11 (Ombudsman Program)

(3) ASAF(A) Acquisition Policy Letter 91M-001 (20 Jun 91)

(4) Air Force Acquisition Model 3.A.3.4 -- Obtain Early Industry Involvement

(5) AFSC RFP Process Guide (to be republished as an AFMC Guide in near future)

f. The Metric Handbook, AFMC Pamphlet 74-9, 26 March 1993

g. The Air Force Process Improvement Guide - Total Quality Tools for Teams and Individuals. (To get a copy send a request to the Air Force Quality Center at Maxwell AFB; DSN 493-3962; FAX 493-3132)

ATTACHMENT C-9. RECOMMENDED READING LIST AND OTHER REFERENCE MATERIAL

1. **Recommended Reading.**

a. Womack, James P., Daniel T. Jones, and Daniel Roos, The Machine That Changed the World, Harper Publishers, New York, New York, 1990

b. Winner, Robert I., James P. Pennell, Harold E. Bertrand, Marko M. G. Slusarczuk, "The Role of Concurrent Engineering in Weapon System Acquisition" Institute for Defense Analyses Report R-338, Virginia, December 1988

c. "Integrated Product Development and Supporting Initiatives' HQ AFMC/ENS Paper 20 July 1992

d. "A Smarter Way to Manufacture", Business Week, April 30 1990, pp 110 - 117

e. "777 Revolutionizes Boeing Aircraft Development Process", Aviation Week & Space Technology, June 3 1991, pp 34 - 36

2. **Additional Reading With Emphasis on Continuous Process Improvement and Process/Product Quality:**

a. Demming, W. Edward, Out of the Crisis, MIT Press, Boston, Massachusetts, 1986

b. Dertouzos, Michael L., Richard K. Lester, Robert M. Solow, MIT Commission on Industrial Productivity, Made In America, Regaining the Productive Edge, The MIT Press, Cambridge Press, Cambridge, Massachusetts, 1989

c. Goldratt, Eliyahu M. and Jeff Cox, The Goal, A Process of Ongoing Improvement North River Press, Croton - on - Hudson, New York, 1984,1986

d. Mann, Nancy R., The Keys to Excellence, Prestwick Publishing, Los Angeles California, 1989

e. Rukeyser, William S., Working Smarter, Viking Press, New York, New York 1988

f. Miller, James B., Corporate Coach

g Hiam, Alexander, Closing the Quality Gap

ATTACHMENT 4. IPD GUIDE EVALUATION

Please fill out the following form and send to the IWSM PROJECT OFFICE:

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Commercial: 513-257-7033

Your evaluation of the IPD Guide will help us produce a better product in future revisions. Thank you, in advance, for your input. Please circle your evaluation:
(1 = poor 6 = Excellent)

1	Format:	1	2	3	4	5	6
2.	Content:	1	2	3	4	5	6
3.	Organization	1	2	3	4	5	6
4.	Helpfulness	1	2	3	4	5	6
5.	Clarity	1	2	3	4	5	6

6. Areas requiring clarification:

7. Suggestions:

ORGANIZATION _____

SUBMITTER _____
(May be submitted anonymously)

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